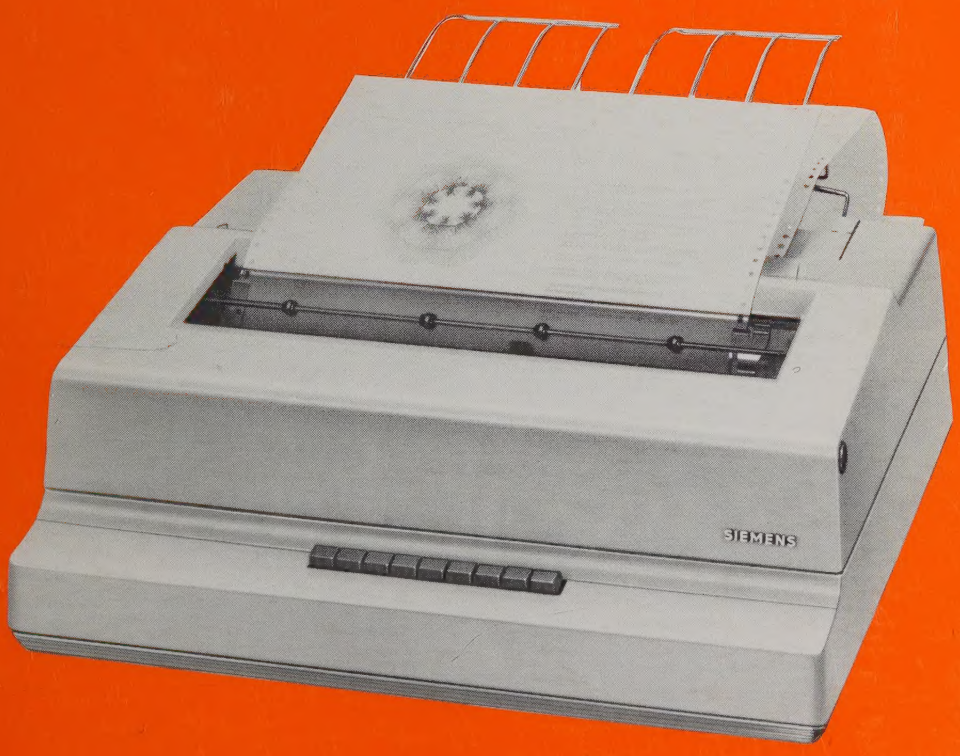
SIEMENS

Printer PT 80 i 2

User's manual



Equipment revision level: see section 5.3

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1 Introduction

The Printer PT 80 i2, a high-speed, silent ink-jet printer, is a further addition to the PT 80 product family. Universal programmability by means of control characters and the graphics printing capability make the Printer PT 80 i2 ideally suitable for a wide range of applications. High printing speed with print path optimization play a particularly important role.

Typical applications are for example:

- Hardcopy printer for video terminals;
- Output printer in time-sharing, information and data base systems;
- Output printer in communications and data networks for the press, police, airlines, shipping companies, railways, banks etc.;
- Output printer for EDP systems, in particular process control computers and switching computers;
- Logging and test data printer in instrumentation and control engineering, and for office computers;
- Output printer for personal computers;
- Output printer for microcomputer development systems.

The printing speed of the PT 80 i2 is 270 cps. The characters are printed in a 9 by 12 matrix. Bidirectional printing with additional print path optimization permits highest data throughput.

Depending on the version, the PT 80 i2 can print on roll paper with a width of 8 1/4" (209 mm) or 8 1/2" (216 mm) or on margin-perforated fanfold paper with a width of 9 7/8" (250 mm) or 14 7/8" (377.8 mm). The version with adjustable paper guide accepts fanfold paper from 8 1/2" (216 mm) to 15 3/4" (400 mm) wide.

All versions can process data in bit-serial and bit-parallel form. Provision is made for the following interfaces:

- Centronics®-type interface for bit-parallel data transfer
- Interfaces conforming with V.24/V.28, RS 232-C and TTY (20 mA current loop).

These interfaces are connected with the relevant data cable and are integrated on the basic electronics GE-MC3.

A receive buffer (2 Kbyte RAM) stores the incoming data.

The electronics of the Printer PT 80 i2 consists of a microcomputer system and allows essentially free programming of all important functions.

The standard character generator of the Printer PT 80 i2 is a PROM containing the character set of the International Alphabet No.5 (IA No.5). This preset character generator can also be switched to seven national character sets by means of control characters.

A loadable character generator allows the programming of up to 95 freely selectable symbols and a blank in a 13 by 12 matrix.

As the print head nozzles can be activated individually, the PT 80 i2 also has a graphics capability (bit-image printing and scanner printing methods).

The programming is described in detail in section 6.2.

2 Technical data

2.1 Printer

Printing method	Ink-jet matrix printing with 12 nozzles (2 rows with 6 nozzles each, offset)
Printing speed	270 cps
Print styles	
- Character printing	Upper case letters, lower case letters with descenders, numerics and special characters; 9 by 12 matrix
- Symbol printing	Using loadable character generator; 13 by 12 matrix
- Graphics printing	Bit-image printing (bit-parallel selection of individual nozzles via interface) and scanner printing (bit-serial selection of individual nozzles via interface)
Character set	Preset character generator with 8 character sets each with 96 characters selectable by means of control characters and straps: - International Alphabet No.5 - ASCII - English - Danish/Norwegian - Swedish/Finnish - German - French/Belgian - Dutch
Loadable character generator	Character generator for 95 freely selectable symbols and a blank, 13 by 12 character matrix
Printing	
- Characters and symbols	Bidirectional line printing with print path optimization
- Graphics printing	Unidirectional with 7 traces/carriage movement for half-line paper feed, continuous black printing
Dot density	
- Horizontal	140 dpi max.
- Vertical	85 dpi

Character spacing	Selectable by means of control characters and straps
- Standard print	1/10"; 1/12"; 1/16.5"
- Expanded print	By doubling the matrix dots 1/5"; 1/6"; 1/8.25"
- Character size	0.11" x 0.07" (2.8 x 1.8 mm) at 10 cpi

Line length

Paper width	Maximum character no. at character spacing of 1/10"	1/12"	1/16.5"	Spacing to center of 1st print column (for 1/10")
Roll paper				
8 1/4" (209 mm)	72	87	119	from left margin 3/4" (19 mm)
8 1/2" (216 mm)	72	87	119	3/4" (19 mm)
Fanfold paper				
9 7/8" (250 mm)	80	97	132	from center of feed hole 3/4" (19 mm)
14 7/8" (377.8 mm)	132	160	217	5/8" (16.1 mm)
15 3/4" (400 mm)	141	171	232	5/8" (16.1 mm)

Line feed	1/6" (4.23 mm) for character printing; and selectable via interface and straps in 1/4-line feed steps (1/24")
Paper feed	Friction feed for version using roll paper Pin wheel feed for version using fanfold paper

Slew rate

- Single-line feed	Approx. 50 ms/line (1/6")
- Continuous feed	Approx. 30 ms/line (1/6")

Print rate at 1/10" character spacing und 1/6" line feed

Characters per line	Characters per second	Lines/min
20	125	375
40	170	255
60	190	190
80	215	160
132	235	105

Sound level during operation	≦ 54 dB(A) as per DIN 45635 part 19 (sound pressure level at measuring surface)

2.2 Ink

Characteristics	Black, indelible and lightfast
Supply	Ink cartridge, easily replaceable, sufficient for approx. 5 million characters
Ink end	Line is completed before printing is interrupted Fault condition is signaled via manual control device and interface

2.3 Paper

(see also section 8)

Paper dimensions	As per ISO 2784 (DIN 9771; DIN 6720) or corresponding national standard

Roll paper without margin perforation

- Width	8 1/4" (209 mm) and 8 1/2" (216 mm) (can be modified in the field)
- Roll diameter	5" (120 mm)
- Paper weight	18 to 24 lbs (70 to 90 g/m)

Fanfold paper with margin perforation *)

- Width	9 7/8" (250 mm) or 14 7/8" (377.8 mm) or 8 1/2" (216 mm) to 15 3/4" (400 mm) (depending on version)
- Fold length	11" or 12"
- Stack height (desk-top model)	5 1/2" (140 mm)
- Paper weight	18 to 24 lbs (70 to 90 g/m)
- Paper end	Printing is interrupted and fault condition is signaled via manual control device and interface

2.4 Dimensions and weights

	Version	
	Paper width up to 9 7/8" (250 mm)	Paper width up to 15 3/4" (400 mm)
Width	16.3" (415 mm)	22" (563 mm)
Height	8.2" (208 mm)	8.2" (208 mm)
Depth	17.5" (443 mm)	17.5" (443 mm)
Weight	37.5 lbs (17 kg)	44 lbs (20 kg)

*) Form feed perforation not required

2.5 Transmission characteristics

Code	IA No.5 (CCITT, ASCII)
Parity check	Even, odd or no parity check (strap-selectable)
Receive buffer	2 Kbyte
Data cable	Approx. 5 ft (1.5 m)

2.5.1 Serial data transfer

Interfaces	CCITT V.24/V.28; RS 232-C; TTY 20 mA
Transfer	Bit-serial, asynchronous
Character frame	1 start element 7 information elements 1 parity element 1 stop element (acknowledgement transmission) 1 or more stop elements (data reception)
Data rate	110, 200, 300, 600, 1200, 2400, 4800, 9600 bit/s
Data flow control	BUSY; X-ON / X-OFF; ETX / ACK; ESC[C / ESC[? s (device identification)
FTZ approval number	FTZ00659D

for	
Datex L	300 bauds
Datex P300	300 bauds
Datex P1200	1200 bauds
Public leased-circuit data network	300/1200 bauds
Telephone network	300/1200 bauds

2.5.2 Parallel data transfer

Interface	Centronics®-type parallel
Transmission method	Start-stop with control and signal lines
Character transmission	7 data bits, 1 parity bit
Transmission speed	2000 cps max.

2.6 Power

Voltage	117 V ac (93.5 to 140 V)	or	220 V ac (187 to 264 V)
Frequency	60 Hz +/-5%		50 Hz +/-5%
Current draw	0.6 A		0.6 A

Fuses	6 x 32 mm (120 V)	5 x 20 mm (220 V)
Primary	T 2 A / 250 V	T 2 A / 250 V
Fan	T 0.1 A / 250 V	T 0.1 A / 250 V
Secondary	T 4 A / 250 V	-
	T 3.15 A / 250 V	-

W A R N I N G : For continued protection against fire hazard replace only with the same type and rating of fuse.

Permissible power voltage interruption	10 ms max.
Connector	Device connector, 2-pin with grounding contact (VDE; UL; CSA)
Power cable	Approx. 8 ft (2.50 m) with device socket and national power plug with grounding contact *)
RF suppression	VDE 0871/6.78 limit value category B FCC Docket No. 20780, April 1980, Class B
Electrical safety	DIN/IEC 380 / VDE 0806/8.81 UL 114, UL 478 CSA C22.2 No. 143, C22.2 No. 154

2.7 Environmental conditions

Operation

- Temperature	+50 F to +105 F (+10 C to +40 C)
- Humidity	
Relative	10% to 90% (no condensation)
Absolute	25 g/m^3
- Low pressure	600 millibars (3500 m above MSL)
- Inclination	7° max. in all planes

Storage and transport

- Temperature	-13 F to +160 F (-25 C to +70 C)
- Humidity	
Relative	10% to 90% (no condensation)
Absolute	25 g/m^3
- Low pressure	350 millibars (6500 m above MSL)

*) See section 8 for ordering number

3 Unpacking the printer

After opening the carton:

- Remove accessory pack.

- Pull out lateral bracing.

- Take hold of the printer plus shipping pallet on the left and right below the pallet and lift printer out of carton and place on a flat surface.

- Unscrew hexagon screws - using 1/2" (13 mm) wrench - on the bottom of the shipping pallet and remove printer from pallet.

- Remove protective covers from printer, accessory pack and connecting cables.

- Check printer and accessories for completeness and for visible shipping damage.

- The contents of the carton are:

  1 printer with data cable
  1 accessory pack with (depending on printer version):
  power cable
  paper deflecting frame
  paper deflector (version for fanfold paper) or
  paper roll axle (version for roll paper)
  1 ink-jet print head (packed separately)

- Check that the serial numbers on printer (on voltage rating plate on rear) and on ink-jet print head package correspond.

- If the print head packing has been opened:
  Check that the up to 5-digit "pair numbers" on the label of the ink-jet print head (vertical on the right-hand side beside the plug connection) and on the printer electronics (visible with the cover removed at the right-hand front edge of the printer electronics) correspond.
  Printer electronics and ink-jet print haed are paired. If a pair is not used, proper print quality cannot be guaranteed.

- Check that the ac power voltage specified on the rating plate at the rear of the printer corresponds with the local voltage (the printer cannot be switched to a different voltage).

Important note:

As the printer can only be shipped safely in its original packaging, all parts of the packaging should be retained for possible reshipment.

4 Installation of the printer

4.1 Installation requirements

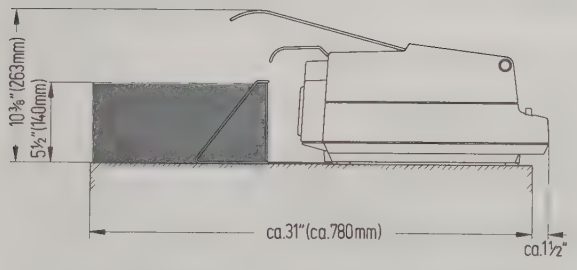


Fig. 4/1 Dimensions of the printer with fanfold paper

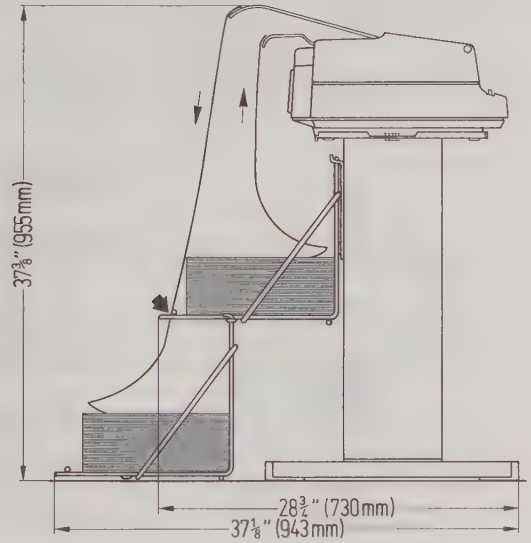


Fig. 4/3 Dimensions of the printer with pedestal

The paper must run through the rear transverse gap (arrow) in the upper paper tray.

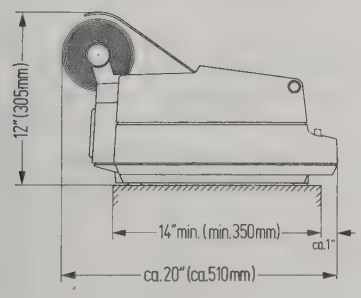


Fig. 4/2 Dimensions of the printer with roll paper

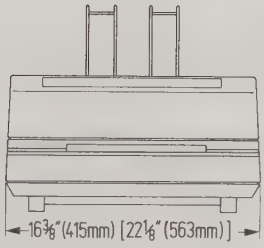


Fig. 4/4 Printer width dimensions

[.....] Dimensions of the versions for 14 7/8" (377.8 mm) and 15 3/4" (400 mm) paper width

4.2 Installation of the ink-jet print head and removal of the transport braces

Before the printer can be operated, the ink-jet print head must be installed on the printer carriage and the transport brace on the printer carriage removed. The transport braces for the printer chassis must be removed from the wide printer version.

4.2.1 Ink-jet print head and printer carriage

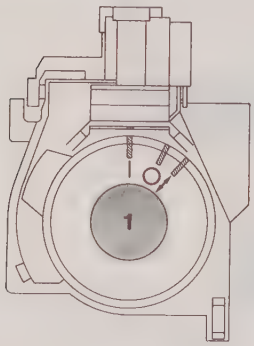


Fig. 4/5

Remove ink-jet print head from packaging.

Positions of ink cartridge:

| Operating position

O Transport position

↕ Replacement position

Turn ink cartridge to the right into its operating position | (Fig. 4/5).

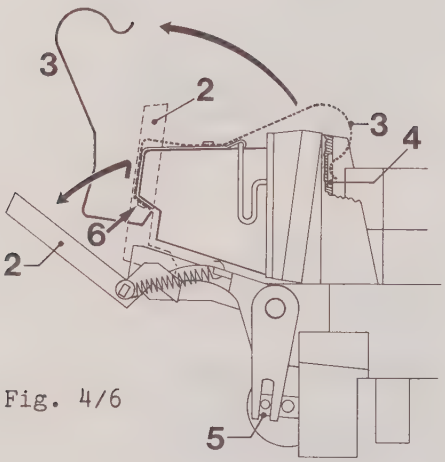


Fig. 4/6

Lift the wiper **2** from its upper position and swing it outward (Fig. 4/6). (If the wiper is not in the position shown by dashed lines in the figure, set it to this position by turning eccentric **5** - see Fig. 4/6.)

Release the transport clip **3** (Fig. 4/6) from notch **4**, move it forward over the nozzle head and unhook it from latching nose **6**.

Do not tilt the ink-jet print head.
Retain the transport clip and print head packaging.

By pressing down strongly on membrane **1** of the ink cartridge (Fig 4/5), force a small amount of ink out of the nozzles **7** (Fig. 4/7).

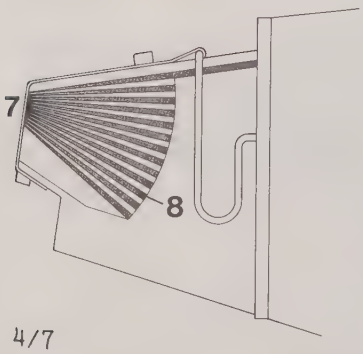


Fig. 4/7

Check in a good light if air bubbles are visible in the ink channels **8** (Fig. 4/7). If necessary, press down on membrane **1** again until the channels are free of bubbles.

Restore wiper to its upper position and turn ink cartridge to the left into its transport position O .
(Do not turn the ink cartridge to its operating position | until all installation work has been completed - see section 4.3.)

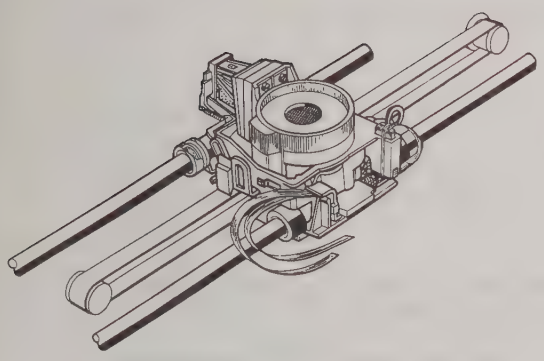


Fig. 4/8

Release transport brace on printer carriage by turning knurled-head screw **9** (Fig. 4/9) through 90°.

Lift up locking wire **10** (Fig. 4/9) of the printer carriage and set in vertical position.

Place ink-jet print head on the printer carriage as shown in Fig. 4/8. Ensure that the guides clamp over the carriage on all four sides.

The print head must slip easily into its correct position.

Do not use force under any circumstances.

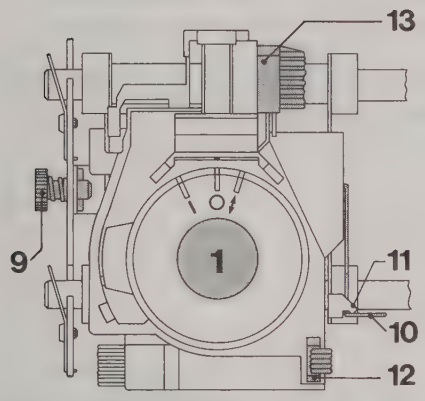


Fig. 4/9

Swing locking wire **10** (Fig. 4/9) downward and hook it under the latching nose **11** .

Make plug connection **12** (red). The red mark must point to the front (this mark and the mark on print head must correspond). Slip rubber ring over plug and receptacle.

Make plug connection **13** . The nose on the plug must point upward.

Important note:

The transport clip must always be installed before the printer or the ink-jet print head is transported.

Check that the transport clip is clean. If necessary, clean under running water. Do not touch the inner sealing band!

Remove print head (Fig. 4/9) and swing wiper **2** (Fig. 4/6) outward. Turn ink cartridge to the operating position | and hook transport clip **3** (Fig. 4/6) over latching nose **6** . Swing the clip backward over the nozzle head and hook it into notch **4** . At the same time, apply steady, light pressure to membrane **1** (Fig. 4/9) of the ink cartridge and check that the ink channels are free of air bubbles.
Check whether ink has collected below the ink cartridge. For this purpose, remove the ink cartridge. Drain off any ink present with tampon or the like. Replace ink cartridge and set to transport position.

4.2.2 Wide printer chassis

The printer chassis for paper widths 14 7/8" (377.8 mm) and 15 3/4" (400 mm) is fitted with an additional transport brace.

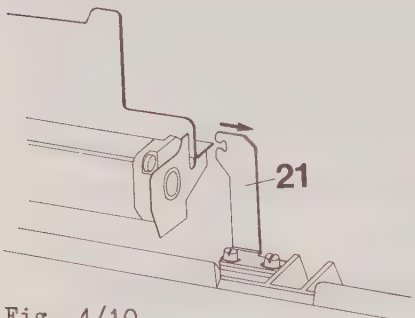


Fig. 4/10

Remove cover as described in section 4.4, Figs. 4/14 to 4/17.

Unscrew screws for brace **21** on the right of the printer (Fig. 4/10).

Push brace to the rear and tighten screws again.

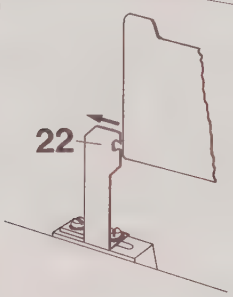


Fig. 4/11

Unscrew screws for brace **22** on the left of the printer (Fig. 4/11). Push brace to the rear and tighten screws again.

For shipment the printer must be secured again with both braces.

4.3 Additional installation work

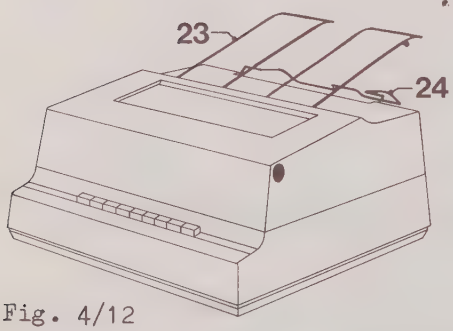


Fig. 4/12

Insert paper deflecting frame **23** and paper deflector **24** (Fig. 4/12) into the relevant holes in the cover. (Printers using roll paper are not fitted with a paper deflector.)

Connect power cable to the printer. (Device connector **25** is at the rear of the printer - Fig. 4/13.)

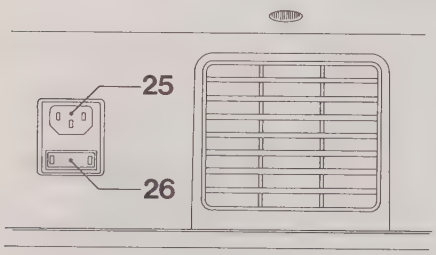


Fig. 4/13

The printer may only be operated with grounding wire connected as per the classes of protection specified (section 2.6).

Switch on printer (switch **26**).

Load paper and set top-of-form position (see sections 6.1.3 to 6.1.5). Turn ink cartridge to operating position | and close top cover.

The printer is ready for operation.

Before the printer is placed in service, a function test can be performed. (See section 5 "Function test".)

4.4 Programming strap settings

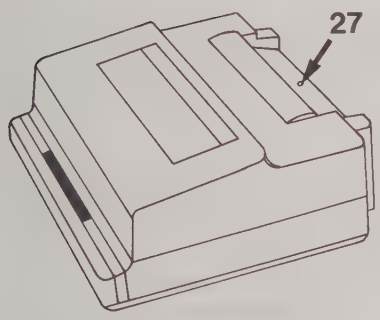


Fig. 4/14

Very important:

> Before removing the cover, pull power plug. Under no circumstances may the power be switched on with the printer cover removed.

Pull power cable.
Open quick-release catch **27** (Fig. 4/14) by turning catch to the left through 90°.

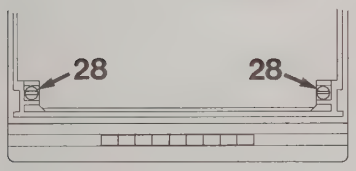


Fig. 4/15

Open top cover. Press buttons on either side of the cover, swing top cover upward until it latches.

Open quick-release catch **28** (Fig. 4/15) by turning catch to the left through 90°.

Remove cover by lifting it upward.

Turn ink cartridge to transport position O .

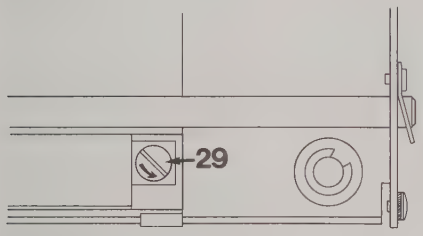


Fig. 4/16

Push printer carriage up against left-hand stop. Open quick-release catch **29** (Fig. 4/16) by turning catch to the left through 90°.

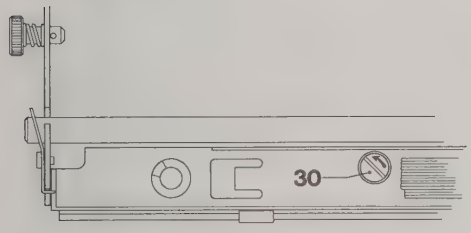


Fig. 4/17

Push printer carriage up against right-hand stop. Open quick-release catch **30** (Fig. 4/17) by turning catch to the left through 90°.

Replacement note: Press down the quick-release catches and turn them through 90° to the right to lock in place.

Raise the printer module and support the bottom of the carrier plate by swinging out the bail. Place the end of the bail in the rectangular box at right front of the basic electronics.

The strapping plugs are on pc board GE-MC3, which is shown in Fig. 4/24.

Before making any change to strap settings, the original status should be noted, or printed out by activating the test mode (section 5).

4.4.1 Strapping plug W27

Function	Strapping plug W 27. 1	2	3	4	5	6	7	8	Notes
ASCII	X	X	X						1*)
Swedish/Finnish	X	X	-						
Danish/Norwegian	X	-	X						
German	X	-	-						
English	-	X	X						
Dutch	-	X	-						
French/Belgian	-	-	X						
International	-	-	-						
Spare straps				-	-				
Tabulator stops set at every 8th position						X			
Relative tabulator						-			1*)
Button "FF LOC" also effective in ON-LINE mode							X		
Button "FF LOC" only effective in OFF-LINE mode							-		1*)
BUSY								X	1*)
BUSY inverted								-	See strap W29.8

X = Strap inserted
- = Strap not inserted
1*) = Factory setting

4.4.2 Strapping plug W28

Function		Strapping plug W 28. 1	2	3	4	5	6	7	8	Notes
Form length 66 lines		X								1*)
Form length 72 lines		-								
No "new line" with CR			X							1*)
CR = CR and LF			-							
No carriage return with FF				X						1*)
Carriage return with FF				-						
No carriage return with VT					X					1*)
Carriage return with VT					-					
No "new line" with LF						X				
LF = LF and CR						-				1*)
Character spacing	1/10"						X	X		1*)
	1/10"						-	-		
	1/12"						X	-		
	1/16.5"						-	X		
No control character printing									X	1*)
Control character printing									-	2*)

X = Strap inserted
\- = Strap not inserted
1*) = Factory setting
2*) = With control character printing, data flow control with DC1 /DC 3 is ineffective

4.4.3 Strapping plug W29

Function		Strapping plug W 29. 1	2	3	4	5	6	7	8	Notes
No received data parity check		X	X							1*) 2*) Bit 8 = H (1)
		-	-							2*) Bit 8 = L (Ø)
Even parity		X	-							For transmission and reception
Odd parity		-	X							
Data rate	9600 bit/s			X	X	X				1*)
	4800 bit/s			X	X	-				
	2400 bit/s			X	-	X				
	1200 bit/s			X	-	-				
	600 bit/s			-	X	X				
	300 bit/s			-	X	-				
	200 bit/s			-	-	X				
	110 bit/s			-	-	-				
CCITT V.24 103, 104, 108.2, BUSY							X	X		EIA: BA, BB, CD, BUSY section 7 1*) 3*)
CCITT V.24 103, 104, 108.2, 107, BUSY							X	-		EIA: BA, BB, CD, CC, BUSY section 7
MODEM operation							-	X		section 7
X-ON / X-OFF and/or ETX / ACK and/or ESC [C / ESC [? s (device identification)									X	1*) section 7
BUSY ON									-	See strap W27.8

X = Strap inserted
- = Strap not inserted
1*) = Factory setting
2*) = Standard value for transmission of acknowledgements
3*) = With BUSY ON, BUSY is also applied to line 103

4.4.4 Straps for TTY connection

Function		Solder strap W 1	2	3	4	5	6	7	8	Notes
TTY transmitter	Internal supply	-	X	X				-		
	External supply with protective resistor	X	-	-				-		1*)
	External supply without protective resistor	-	-	-				X		
TTY receiver	Internal supply				-	X	X		-	
	External supply with protective resistor				X	-	-		-	1*)
	External supply without protective resistor				-	-	-		X	

X = Solder strap inserted (see section 7.1.2)
\- = Solder strap not inserted
1*) = Factory setting

4.5 Compensation for column offset (strapping plug W30)

Mechanical tolerances (play) of the carriage drive and different load angles of the carriage motor in the two print corrections cause lateral offset between lines printed during the forward motion and the reverse motion of the carriage. Compensation can be made for this offset by shifting the instant of printing. As the amount of offset differs from printer to printer, this compensation must be variable. The printing instant is shifted using straps W30.3 to W30.8 (Fig. 4/24).

It is not normally necessary to change the factory alignment. If parts (toothed belt, motor, gear wheels) are replaced and realignment becomes necessary, it can be performed as follows.

Very important: The printer may not be under power unless the printer chassis is locked (Figs. 4/16 and 4/17) and the cover is installed. The printer may only be operated with the top cover closed.

- Set the character spacing to 1/10" with straps W28.6 and W28.7.
  Insert all straps W30.3 to W30.8 on strapping plug.
  Activate test mode (see section 5) and print at least three lines with test program 2 (Fig. 4/20).

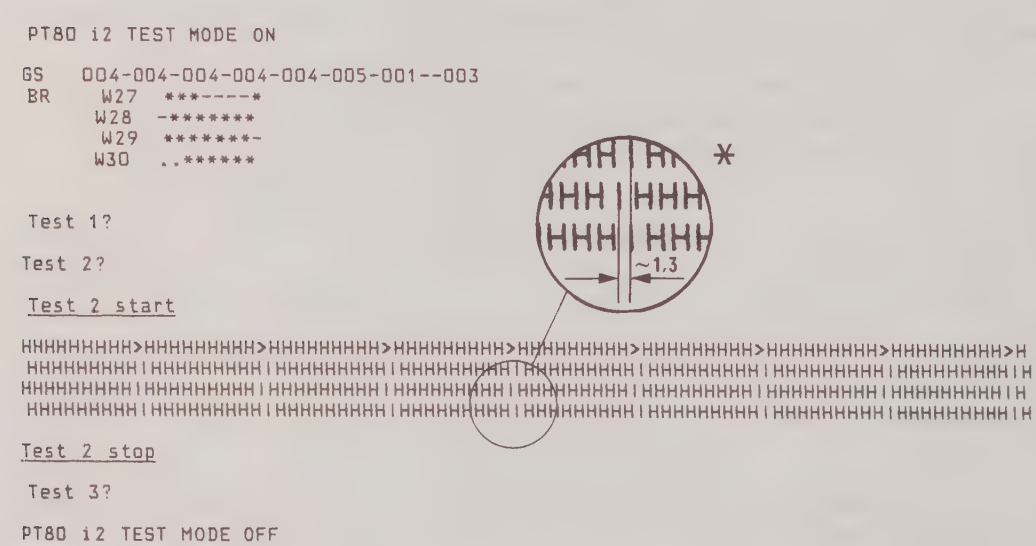


Fig. 4/20 Test printout example (reduced in size) with straps W30. inserted. (* see text)

- Measure lateral offset of the vertical lines of two consecutive lines approx. in the center of the line. Use a magnifying glass with a reading accuracy of 0.1 mm.
  In Fig. 4/20 (increased in size) the offset is 1.3 mm.

- The following table shows the number of millimeters by which the lines are displaced with respect to each other on removal of the corresponding strap:

Strap	W30.3	W30.4	W30.5	W30.6	W30.7	W30.8
Displacement in mm	*)	1.9	1.0	0.5	0.25	0.1

*) = only effective with 1/16.5" character spacing

Remove the straps which - as sum of the individual amounts - come closest to the displacement. In the case shown here, straps W30.5 = 1 mm, W30.7 = 0.25 mm and W30.8 = 0.1 mm (sum 1.35 mm) have been removed.

- Print out at least three lines as a check with test program 2 (Fig. 4/21). Then deactivate test program and test mode.

```
PT80 i2 TEST MODE ON

GS   004-004-004-004-004-005-001--003
BR    W27  ***-----*
      W28  -*******
      W29  *******-
      W30  ..**-*--


Test 1?

Test 2?

Test 2 start

HHHHHHHHH>HHHHHHHHH>HHHHHHHHH>HHHHHHHHH>HHHHHHHHH>HHHHHHHHH>HHHHHHHHH>HHHHHHHHH>HH
HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HH
HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HH
HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HHHHHHHHH|HH

Test 2 stop

Test 3?

PT80 i2 TEST MODE OFF
```

Fig. 4/21 Test printout example (reduced in size) with column offset compensation performed

- If the result is not satisfactory, repeat the correction with different strap combinations.

- Set character spacing of 1/16.5" with straps W28.6 and W28.7.
Print out at least three lines with test program 2. Deactivate test program and test mode.

```
PT80 i2 TEST MODE ON

GS   004-004-004-004-004-005-001--003
BR    W27  ***----*
      W28  -****-**
      W29  *******-
      W30  ..**-*--


Test 1?

Test 2?

Test 2 start

HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHH
HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHH
HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHH
HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHH
HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHH

Test 2 stop

Test 3?

PT80 i2 TEST MODE OFF
```

Fig. 4/22 Test printout example (reduced in size) with character spacing of 1/16.5" with strap W30.3

- Pull strap W30.3 and repeat test printout.

```
PT80 i2 TEST MODE ON

GS   004-004-004-004-004-005-001--003
BR    W27  ***----*
      W28  -****-**
      W29  *******-
      W30  ..*-*--


Test 1?

Test 2?

Test 2 start

HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHHHHHH>HHHHHH
HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHH
HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHH
HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHHHHHH|HHHHHH

Test 2 stop

Test 3?

PT80 i2 TEST MODE OFF
```

Fig. 4/23 Test printout example (reduced in size) with character spacing of 1/16.5" without strap W30.3

- Compare the two test printouts and set the strap combination with the lowest column offset. Then restore original character spacing with W28.6 and W28.7.

Compensation of column offset has now been completed.

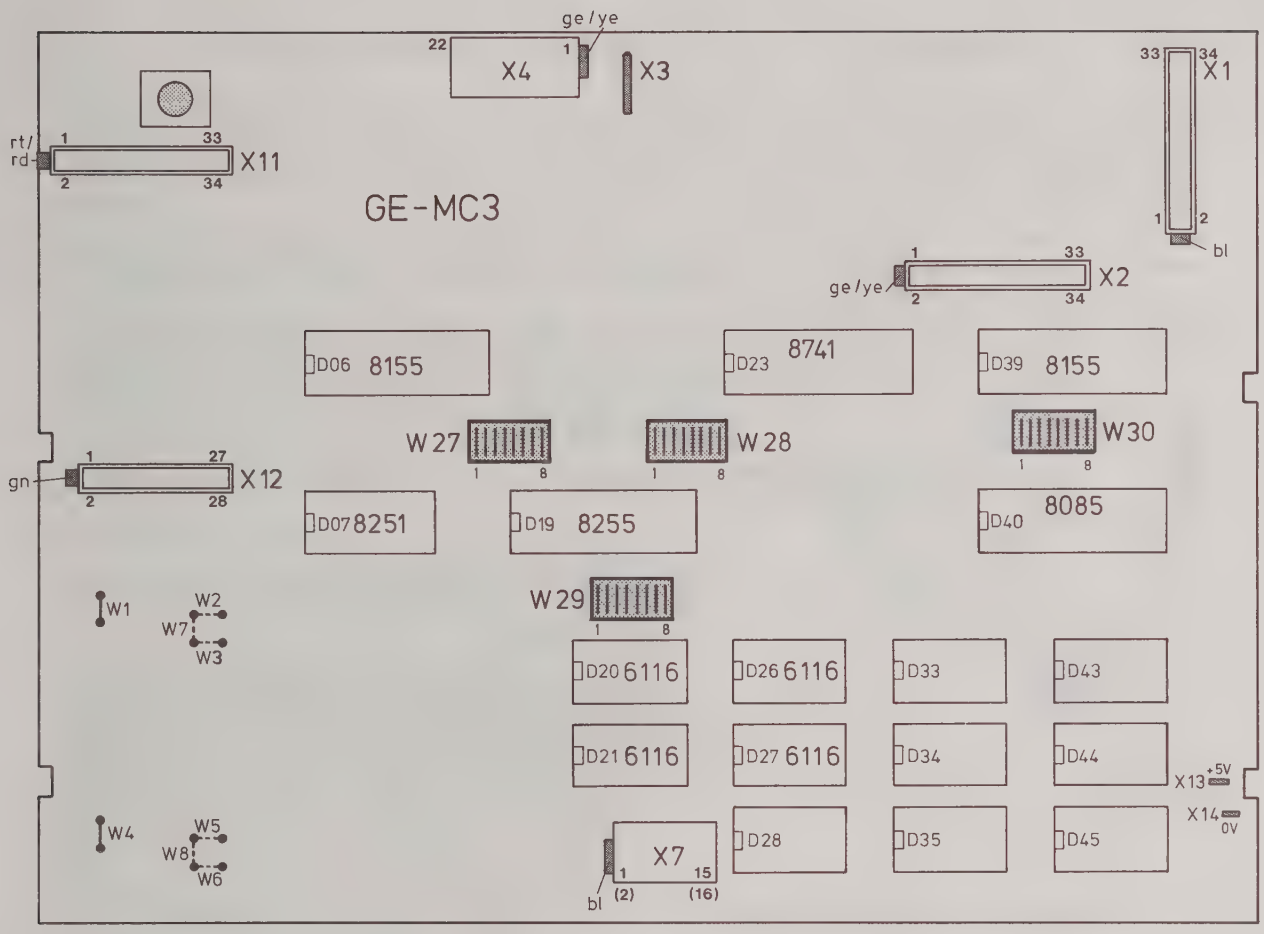


Fig. 4/24 Basic electronics GE-MC 3 (components side, plug connectors - pin side)

X11 Plug connector for parallel data transmission
X12 Plug connector for serial data transmission
X1 Plug connector for power supply
X2 Plug connector for printer module
X7 Plug connector for manual control device
X4 Plug connector for automatic sheet feeder
X3 Chassis ground

D23	Programmed processor device	Item code number: S22751-K144-C1
D33	Program device	Item code number: S22751-K144-C2
D34	Program device	Item code number: S22751-K144-C3
D35	Program device	Item code number: S22751-K144-C4
D43	Program device	Item code number: S22751-K144-C5
D44	Program device	Item code number: S22751-K144-C6
D45	Character generator	Item code number: S22751-K151-A1
D28	Program device	Item code number: S22751-K144-C7

4.6 Adjustment for other paper width

The version for roll paper can print on paper with a width of 8 1/4" (209 mm) and 8 1/2" (216 mm). It is only necessary to move the right-hand guide **31** (Fig. 4/25).

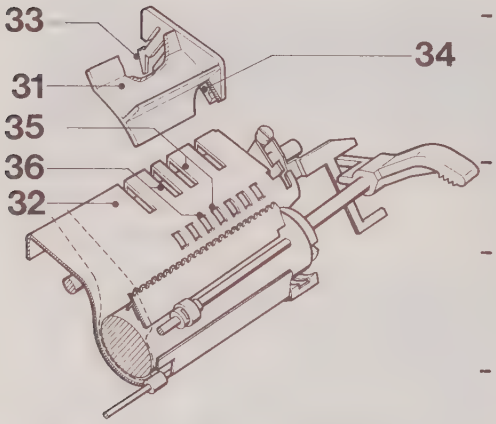


Fig. 4/25

- Press buttons on either side of the cover, swing top cover upward until it latches.
- From the right, reach below and behind guide plate **32** at the side, press latching nose **33** in the direction of the platen and then upward.
- Pull paper guide **31** to the front, up and out.
- Hook nose **34** into the front of the two cutouts **35** for 8 1/2" (216 mm) or **36** for 8 1/4" (209 mm).
- Press paper guide downward until latching nose **33** latches. The adjustment has been completed.

5 Test mode

5.1 Self-test

Each time the Printer PT 80 i2 is switched on, an automatic self-test is performed.
In this self-test, the individual areas of the microcomputer system of the printer are checked. If an error is detected, the test is interrupted. A buzzer and displays on the manual control device provide an indication of the type of error. To restart the self-test, the printer must be switched off, the cause of the fault eliminated and the printer switched on again.
A detailed description of the self-test is given in section 5 of the "Description and Troubleshooting Instructions Printer PT 80 i2", which can be ordered under the number A22751-A80-M200-*-7635. A list of possible error indications and their causes is given in the table, Fig. 5/1.

- Expanded self-test

The operator can supplement the self-test with a CRC test.

Switch on the printer while holding pushbutton [TEST] down.

Hold the pushbutton down until the synchronization run starts (the pushbutton must then be released) or the printer "indicates" an error.
In this test, the program generates a test word for each EPROM, which is compared with a word stored in the PROM. If there is a discrepancy, the printer indicates "CRC error" (table in Fig. 5/1).

Buzzer	PRTR ON/OFF	ON/OFF LINE	TEST	Significance of indication
*	Undefined			8085 (CPU) or "Power ON reset" defective
*	*	*	-	EPROM 0 mounting position error
+	-	*	*	RAM D39 error
+	-	-	-	RAM error
+	-	*	-	RAM data error
+	*	-	-	EPROM mounting position error
+	*	*	-	EPROM CRC error
+	*	-	*	8741 (UPI) error
-	+	-	-	Ink or paper exhausted *)

* Continuous signal + Intermittent signal - No signal
*) See section 6

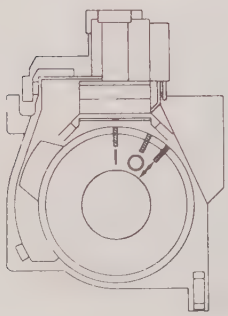
Fig. 5.1 Error indications in self-test

5.2 Function test

It is essential that:

- paper and ink are available,
- ink cartridge is in its operating position ▏,
- printer is switched on and
- display [PRTR ON/OFF] no longer flashes.

[ON/OFF LINE]	If display in this pushbutton is illuminated, press pushbutton to switch off display. The data cable need not be connected.	
[PAPER FEED]	Press button briefly:	Paper is advanced one 1/24"-step (approx. 1 mm)
	Hold button depressed:	Paper is advanced as long as pushbutton is pressed
[PAPER BACK]	Press pushbutton:	Paper is fed back one 1/24"-step each time pushbutton is pressed
[FF LOC]	Press pushbutton:	Paper is advanced by one form length each time pushbutton is pressed
[ON/OFF LINE]	Press pushbutton:	Display in pushbutton illuminated. Synchronization run is performed. On pressing the other pushbuttons, there may not be a response (Exception: [FF LOC] with strap W27.6 inserted)
[ON/OFF LINE]	Press pushbutton again:	Display in pushbutton goes dark
[TEST]	Press pushbutton:	Display in pushbutton illuminated
[TEST]	Press pushbutton again:	Display in pushbutton goes dark



Turn ink cartridge to position ○ :	Display [PRTR ON/OFF] must flash	Turn ink cartridge to position ▏ :	Display [PRTR ON/OFF] must go dark

[ON/OFF LINE]	Press pushbutton:	Printer switches to ON-LINE mode

5.3 Operator test

The operator test comprises five different test programs, which can be called up and started in turn via the manual control device. Individual programs can be skipped by pressing the "PAPER BACK" pushbutton without starting the program indicated via a printout.

Activation and deactivation of the operator test

The operator test can only be activated in the OFF-LINE mode of the printer. If the printer is switched to the fault condition (the "PRTR ON/OFF" display flashes) during the test mode due to exhaustion of the ink or paper supply, the printer can only be switched on again after a synchronization run (switch briefly to ON-LINE mode). Deactivation is only possible with the individual program stopped (pushbutton "PAPER BACK").

TEST — Press pushbutton: display "TEST" is illuminated. Deactivation without printer response is possible by pressing the pushbutton again. The display "TEST" goes dark.

PAPER FEED — Press pushbutton: the printer is reset to the initial status (as with control character ESC c). The printout is then as follows:

```
PT80 i2 TEST MODE ON                          Significance:
                                              GS = revision level of program-
GS    005-005-005-005-005-005-002--003 med devices in the sequence
BR     W27  **------                          D33,D34 and D35;
       W28  -*-*****                          D43, D44, D45, D28 and D23.
       W29  ****-***                          BR = strap assignment
       W30  ..**-*-*                          * = strap; - = no strap;
                                              . = not connected

Test 1?                                       Test 1? = offered test program
```

PAPER FEED — Press pushbutton: the test program offered is started. The printout is as follows: Test n start. The test program is then printed out. "n" is the offered test program number.

PAPER BACK — Press pushbutton: the test program in progress is stopped at the end of the line. The printer then prints in the next but one line: Test n stop and 2 lines further: Test n ?
"n" is the number of the next program offered. Exception: test programs 4 and 5. In these cases the same program is offered again.

PAPER BACK — Press pushbutton without a program in progress: the printer offers the next program by means of a printout. After program 5, the printer again starts with program 1.

TEST — Press pushbutton after individual program stop:
After an empty line, the printer prints: PT80 i2 TEST MODE OFF , performs a form feed and the display "TEST" goes dark.

5.4 Operator test programs

TEST 1 Text printout test

This test is used to assess the print quality and to check the preset character generator (section 6.2.11). The character set selected with the programming straps (section 4.4) is printed in cyclic manner.
The first line begins with the character "!" (hex. 21) and the following lines each begin with the second character of the previous line. For example:

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abc
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcd
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcde
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdef
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefg
```

TEST 2 H test

This test is used to check and align the column offset between the two print directions (section 4.5).

TEST 3 12-nozzle test

The test is used to check the 12 ink nozzles of the ink-jet print head. In the first print column of each print position, a line is printed over all 12 traces. The line spacing is 2-line.
If the loadable character generator is however loaded with characters before the start of the test, they are printed out cyclically.

TEST 4 Line contact test

This test is used to check and adjust the start-of-line and end-of-line contacts. Both contacts are sampled in a synchronization run. This test is terminated automatically and, at the end of the test, the positions of the contacts with respect to the relevant motor steps, and the maximum printable number of characters in all three character spacing sizes are printed out.

```
|   2/4   082   099   135
```

The significance of the above is as follows:

|	= middle of first print character with 1/10" character spacing
2/4	= switch positions of start-of-line and end-of-line contacts
082 099 135	= maximum character number for character spacings 1/10", 1/12" and 1/16.5".

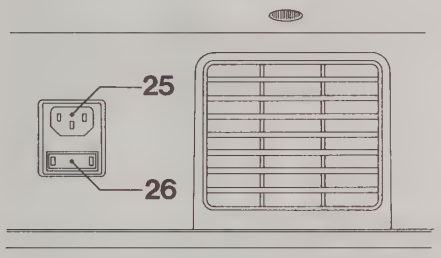
TEST 5 Bit-image test

This test is used to check uniform line spacing. With half-line feed (1/12"), an empty line is produced. In 5 lines, in a length which corresponds to 40 characters at 1/10", every fourth print column is printed via 7 nozzles of the ink-jet print head. At the start of the line a space is left which corresponds to 8 characters at 1/10". This test is also terminated automatically.

6 Application and operation

6.1 Operation

6.1.1 Power switch



The power switch **26** is located at the rear of the printer (Fig. 6.1/1) directly below the device connector **25**.

Fig. 6.1/1

When the printer is switched on the power-on phase starts, i.e.:

- The display PRTR ON/OFF on the manual control device flashes.
- If paper and ink are available, the printer carriage performs a synchronization run after a few seconds *).

  It travels first to the start of the line, next to the end of the line, then stops and display PRTR ON/OFF goes dark.

  During this run the positions of the start-of-line and end-of-line contacts are sampled and stored.

- If paper and/or ink are not available, the only response is the flashing display.

  The synchronization run is performed when paper has been loaded and/or the ink cartridge installed or replaced and switchover to the ON-LINE mode.

- After the power-on phase, the printer assumes the initial status (see section 6.2.2).

The top-of-form position must be entered (see section 6.1.4).

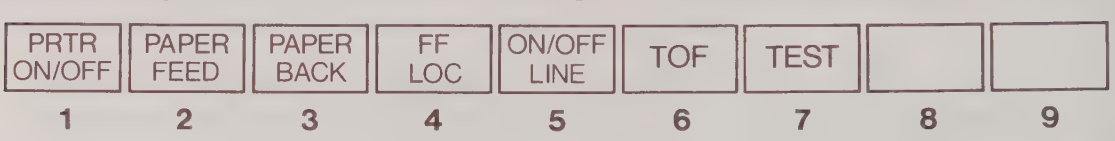
The following must be strictly observed when the printer is switched off:

The printer must be in the OFF-LINE mode when it is switched off. Ensure that the wiper (seal) in front of the nozzles on the ink-jet print head is in its upper position (see section 4.2, Fig. 4/6). When the printer is switched off, all values (parameters) preset by means of control characters, the contents of the loadable character generator and any data which may be in the receive buffer are lost.

*) During this period, the printer performs the self-test (section 5.1). At the same time, the nozzle heater starts up. The temperature of the ink-jet print head is regulated to prevent the ambient temperature influencing the print quality. As long as the ink nozzles have not reached the nominal temperature, the printer is set to the error state. When the nominal temperature ois reached, the program continues automatically.

6.1.2 Manual control device

The manual control device has 9 pushbutton positions. The pushbuttons are also used as display elements and have multiple functions in some cases.



Pushbutton/ display	Function
1 PRTR ON/OFF	Display: Data in receive buffer / malfunction Display illuminated: Data in receive buffer Display flashes: Ink end (OFF-LINE mode), during power-on phase, paper end, ink end, ink cartridge not installed or incorrectly set (see section 6.1.7)
2 PAPER FEED	Pushbutton: Paper feed / start test program (in test mode). Only effective in OFF-LINE mode (Also effective in ON-LINE mode with strap W27.7 inserted) Paper feed: Pushbutton pressed briefly (less than approx. 0.3 s): Paper advances one 1/24" step Pushbutton held down (more than approx. 0.3 s): Paper advances steadily as long as the pushbutton is pressed
3 PAPER BACK	Pushbutton: Paper reverse / test program OFF (in test mode) Only effective in OFF-LINE mode (Also effective in ON-LINE mode with strap W27.7 inserted) Paper reverse: Paper is fed back one 1/24" step each time pushbutton is actuated. No continuous feed
4 FF LOC	Pushbutton: Form feed / top-of-form position (in conjunction with pushbutton TOF) Only effective in OFF-LINE mode (Also effective in ON-LINE mode with strap W27.7 inserted) Form feed: Paper is advanced to next top-of-form position each time pushbutton is actuated

Pushbutton/ display	Function
5 ON/OFF LINE	Pushbutton: ON/OFF LINE selection Display: ON-LINE Pushbutton for selection of ON-LINE and OFF-LINE modes. ON-LINE mode (display illuminated): Data arriving at the interface are accepted. The functions of all other pushbuttons with the exception of FF LOC are suppressed. A synchronization run is performed on switching from the OFF-LINE mode to the ON-LINE mode. OFF-LINE mode (display not illuminated): The functions of all pushbuttons are enabled. Switchover from the ON-LINE to the OFF-LINE mode: - The line being printed is completed and the printout is interrupted. - The printer signals "Not ready to accept" and "Not ready to operate" at the interface. Incoming data are accepted until the buffer is full, but no signal is given and further incoming data are lost. - On switching back to the ON-LINE mode the rest of the receive buffer contents is printed out. With paper or ink end (display PRTR ON/OFF flashes), the printer automatically switches to the OFF-LINE mode. Return to the ON-LINE mode is possible only after replenishment of paper and/or ink.
6 TOF	Pushbutton: Top-of-form position. Only effective in OFF-LINE mode Top-of-form position: With the pushbutton TOF pressed, pushbutton FF LOC resets the line counter Whenever the printer is powered up or the paper supply replenished or on placing in service, it is necessary to program the top-of-form position again (section 6.1.4).
7 TEST	Pushbutton: Test mode ON/OFF. Only effective in OFF-LINE mode Display: Test mode ON Pushbutton for ON/OFF switching of test mode (see section 5). In the ON-LINE mode, during an operation interruption and during the power-on phase (display PRTR ON/OFF flashes), the function is suppressed
8	No function
9	No function

6.1.3 Loading fanfold paper

In the paper end condition (display PRTR ON/OFF in the manual control device flashes) or when the paper supply runs low, new paper must be loaded.
If the printer is in the ON-LINE mode, it must be switched to the OFF-LINE mode.

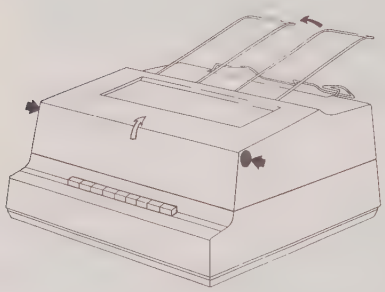


Fig. 6.1/2

- Swing paper deflecting frame to the front
- Press the two buttons on the side of the top cover at the same time (Fig. 6.1/2) and swing back the top cover until it snaps into place

6.1.3.1 Fixed paper guide

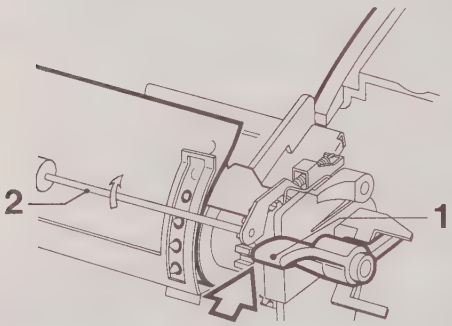


Fig. 6.1/3

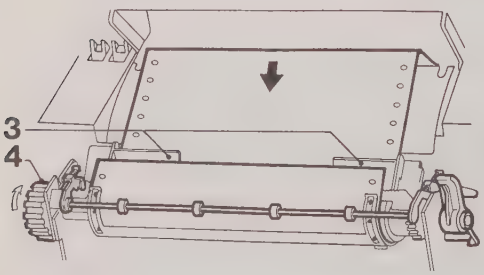


Fig. 6.1/4

- Swing paper release lever **1** and paper pressure rod **2** upward (Fig. 6.1/3)
- Turn the platen knob to remove any remaining paper to the front
- Introduce the fanfold paper under the top cover and through into the paper guides **3** until the leading edge is below the platen (Fig. 6.1/4)
- Turn the platen knob **4** and ensure that the pins of the platen engage the margin perforation at the same level on both sides of the paper
- Return paper release lever **1** (Fig. 6.1/3) to its lower position
- Program top-of-form position as per section 6.1.4
- Advance paper with pushbutton PAPER FEED to tear-off edge **14** (Fig. 6.1/6)
- Swing paper pressure rod **2** (Fig. 6.1/3) down over the paper and close top cover

6.1.3.2 Adjustable paper guide

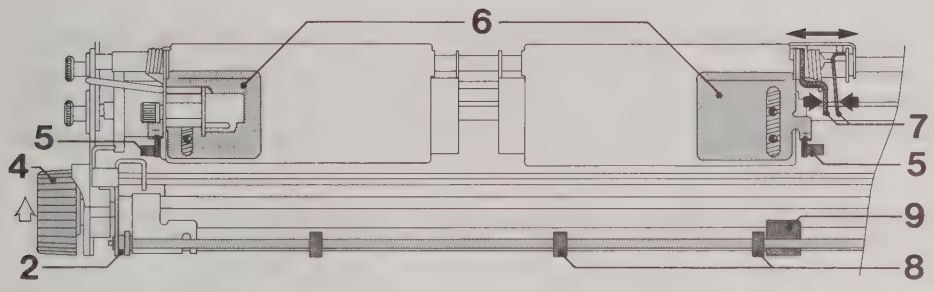


Fig. 6.1/5

- Preparation: (See Fig. 6.1/2)
- Turn platen knob **4** (Fig. 6.1/5) to remove remaining paper to the rear
- Press left-hand flap lock **5** forward and thus open left-hand flap **6**
- Feed the fanfold paper under the top cover as far as the platen
- Push fanfold paper at the side under left-hand flap and place on the pin wheel. Ensure that the perforation is engaged by at least two pins
- Press the left-hand flap **6** down and close
- Swing paper pressure rod **2** upward and hold in this position
- Press together the two clamping wires **7** and displace the right-hand paper guide to the left or right depending on the paper width. Place fanfold paper on the right-hand flap **6** (still closed). Release paper pressure rod
- Press right-hand flap lock **5** forward and thus open associated flap **6**
- Push fanfold paper at the side under right-hand flap and place on the pin wheel. Ensure that both sides of the paper are engaged at the same level
- Press the right-hand flap **3** down and close
- Check that slight lateral movement of the paper is possible, otherwise correct paper guide adjustment
- Program top-of-form position as per section 6.1.4
- Swing paper pressure rod **2** upward and hold in this position
- Advance paper to tear-off edge with button PAPER FEED

  Under no circumstances advance paper with platen knob
- Swing paper pressure rod down over the paper and close top cover

Note:
If one of the rollers **8** (Fig. 6.1/5) comes into contact with pressure spring **9**, shift this roller to avoid a paper jam.

6.1.4 Top-of-form position

Each time the printer is switched on (and after a power outage), the current position of the paper is recognized as the top-of-form position. If this position does not coincide with the actual initial position, the top-of-form position must be programmed again. If form feed perforation is present, it is not interpreted.

The top-of-form position must always be programmed again when new fanfold paper is loaded.

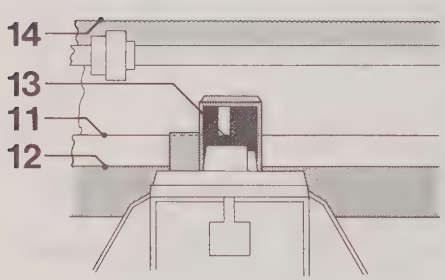


Fig. 6.1/6

- Swing paper deflecting frame to the front
- Press the two buttons on the side of the top cover at the same time (Fig. 6.1/2) and swing back the top cover until it snaps into place
- Advance paper with rotary knob until the leading edge of the paper or perforated fold is visible at the level of the upper edge of paper guide **12** (Fig. 6.1/6)
- Advance paper with pushbutton [PAPER FEED] in single steps until the leading edge or perforated fold **11** is visible at the lower edge **13** of the wiper window (Fig. 6.1/6)
- With pushbutton [TOF] pressed, briefly press pushbutton [FF LOC]
- The top-of-form position is set. The first possible print line is directly below the reference line used for the adjustment

After replenishing the paper, continue as described in section 6.1.3. Otherwise, only close the top cover.

6.1.5 Loading roll paper

In the paper end condition - display PRTR ON/OFF flashes - or when the paper supply runs low, a new paper roll is required.

If the printer is in the ON-LINE mode, it must be switched to the OFF-LINE mode.

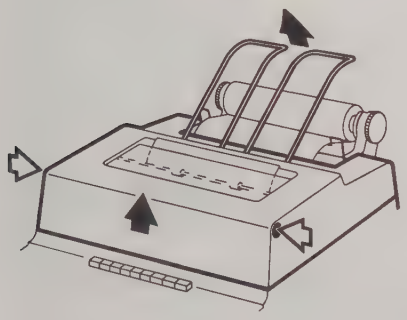


Fig. 6.1/7

- Swing paper deflecting frame to the front
- Press the two buttons on the side of the top cover at the same time (Fig. 6.1/7) and swing back the top cover until it snaps into place

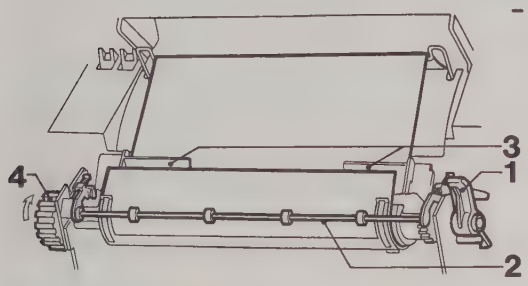


Fig. 6.1/8

- Swing paper release lever **1** and paper pressure rod **2** upward (Fig. 6.1/8)

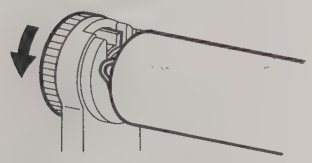


Fig. 6.1/9

- Release the paper roll axle on both sides (Fig. 6.1/9)

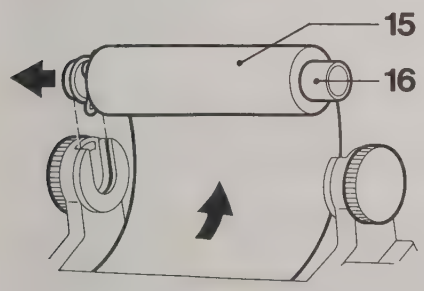


Fig. 6.1/10

- Draw out remaining paper to the rear and withdraw axle **16** from used paper roll **15** (Fig. 6.1/10)

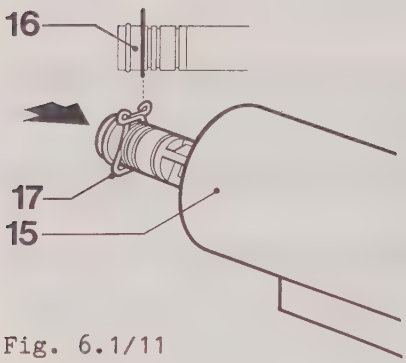


Fig. 6.1/11

- Insert the paper roll axle **16** into the new paper roll **15** (Fig. 6.1/11)
- The wire clip **17** must be in contact with the paper (if a paper roll axle with wire clip is used)

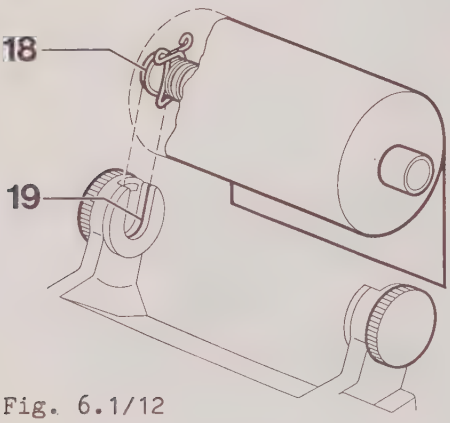


Fig. 6.1/12

- Slot the axle into the holders and lock in place
- The paper path must be as shown in Figs. 6.1/12 and 6.1/13
- The O-ring **18** on the axle must lie in the groove **19** of the left-hand holder

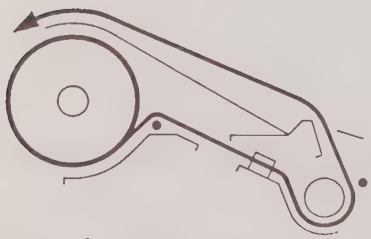


Fig. 6.1/13

- Paper path (Fig. 6.1/13) seen from the side

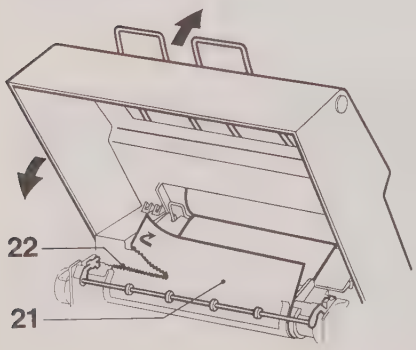


Fig. 6.1/14

- Swing paper release lever **1** (Fig. 6.1/8) downward
- Lead paper **21** over the tension regulating rod and through under the top cover into paper guides **3** until it is located below the platen (Figs. 6.1/8 and 6.1/13)
- Advance the paper with the platen rotary knob **4** (Fig. 6.1/8) until it protrudes above the tear-off edge **22** (Fig. 6.1/14)
- Return the paper pressure rod **2** to its lower position (Fig. 6.1/8), tear off the protruding paper at the tear-off edge **22** to the rear (Fig. 6.1/14) and close top cover.

6.1.6 Replacing the ink cartridge

The ink cartridge can be set to three positions:

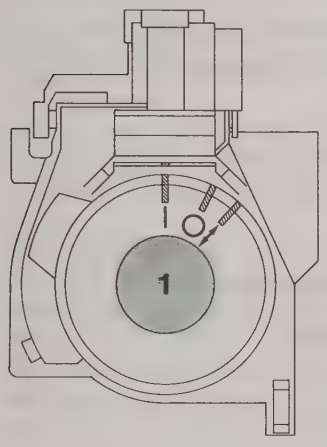


Fig. 6.1/15

Operating position

For operation this mark must point towards the platen (Fig. 6.1/15).

Transport position

For transport of the ink-jet print head or printer this mark must point towards the nozzle head (platen).

Replacement position

For replacement of the ink cartridge this mark must point towards the nozzle head (platen).

In the ink end condition - the printer switches to the OFF-LINE mode and the display PRTR ON/OFF flashes - the ink cartridge must be replaced. If the ink cartridge is exchanged as a precaution before "ink end", the printer must be switched to the OFF-LINE mode.

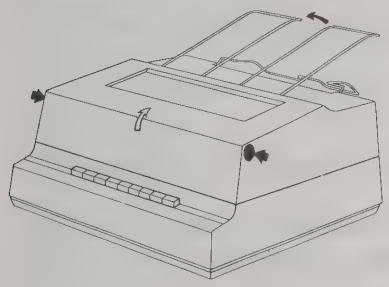


Fig. 6.1/16

- Swing paper deflecting frame to the front
- Press both buttons on the side of the top cover at the same time (Fig. 6.1/16) and swing back the top cover until it snaps into place
- Turn ink cartridge to the left into its replacement position ↕ and pull up and out
- Insert new ink cartridge in position ↕ in ink-jet print head
- Press down lightly on the ink cartridge and turn it to the right into its operating position |

  Ensure that the wiper is in its upper position
- Force a small amount of ink through the nozzles by briefly exerting strong pressure on membrane **1** of the ink cartridge
- Close top cover.

6.1.7 Operation interruptions

P a p e r e n d

The paper end condition - display PRTR ON/OFF flashes - terminates printing at the end of the line and the printer switches to the OFF-LINE mode.

Remedy: Replenish paper (see sections 6.1.3 to 6.1.5).

Press pushbutton ON/OFF LINE to continue printing (see section 6.1.2).

I n k e n d

The ink end condition - display PRTR ON/OFF flashes - terminates printing immediately and the printer switches to the OFF-LINE mode.

Remedy: Replace the ink cartridge (see section 6.1.6).

Press pushbutton ON/OFF LINE to continue printing (see section 6.1.2).

P o w e r o u t a g e

After power OFF or a power outage, all parameters such as top-of-form position, line length, line spacing, character spacing, etc. preset via the interface or via pushbuttons are lost.

Remedy: Program again the required data as per section 6.2 and the top-of-form position as per section 6.1.4.

P o o r p r i n t q u a l i t y

Poor print quality and missing traces can be caused by paper dust or air bubbles in the ink system of the print head.

Remedy: Activate the OFF-LINE mode and open the top cover.

Ensure that the wiper is in its upper position - wiper window is visible.

Briefly exert strong pressure on the membrane **1** (see section 6.1.6, Fig. 6.1/15) of the ink cartridge. If necessary, repeat procedure.

6.2 Programming

Full use of the options offered by microcomputer control allows variation of all printout parameters.

Such parameters are form length, line length, line spacing, start and end of line, first and last printable line, character spacing etc.

The Printer PT 80 i2 has a defined initial status (see section 6.2.2). This initial status can be changed by means of control characters and control character sequences via the interface.

The control characters (control character sequences) are shown in three ways. The first line specifies in clear text the control characters and information characters assigned to the binary structured table of the International Alphabet No. 5 (ASCII Code). The HEX. line shows the hexadecimal assignment of the table positions (area ØØ to 7F) and the DEC. line shows the hexadecimal designation converted into the corresponding table position numbering (ØØØ to 127).

Example: Code character CR → HEX.: ØD → DEC.: Ø13

6.2.1 Initial status

The initial status is automatically assumed after "power ON" (and after a power outage). Some characteristics of the initial status can be changed by relocating straps (see section 4.4).

This initial status is as follows:

- Receive buffer reset
- Loadable character generator reset
- Character set as per strap setting of W27.1 - W27.3 (section 4.4.1)
- Single line spacing (1/6")
- Character spacing as per strap setting W28.6/W28.7 (section 4.4.1)
- Form length as per strap setting W28.1 (section 4.4.2)
- Printable area (first and last print line) as per form length
- Line length as per paper width (recognition in synchronization run)
- Horizontal tabulator as per setting of strap W27.7 (section 4.4.2)
- Vertical tabulator with relative tabulation
- The current paper position is interpreted as the top-of-form position (see section 6.1.4)

6.2.2 Resetting to the initial status

By means of the control character sequence

IA No.5/ASCII	:	ESC	c
HEX.	:	1B	63
DEC.	:	Ø27	Ø99

all parameters listed in section 6.2.1 - with the exception of the top-of-form position and receive buffer reset - can be reset to the initial status. The form is fed in accordance with the form length set by strap W28.1.

6.2.3 Form printing (print area)

In many cases, particularly when forms are used, the area for printing is considerably smaller than the form area.

The time taken to print the forms - and also the number of control characters required - can be reduced by appropriate programming of the parameters "form length" (section 6.2.3.1), "printable area" (section 6.2.3.2) and "line length" (section 6.2.3.3). If the printable area is exceeded, form feed to the first print line of the following form takes place.

6.2.3.1 Form length

Form length is the spacing between, for example, two successive cross perforations of the printer paper, for example, given in single-line (1/6") line spaces. Form feed is initiated by the control character FF. If no character has yet been printed in the first printable line, no form feed is performed. In the initial status, the form length is fixed by strap W28.1 (see section 4.4.2) and set to 66 or 72 single-line line feeds (together 11" or 12") for one form feed.

To allow the printer to handle other form lengths, form feed can be set to between 1 and 99 single-line line spaces by means of control characters. It must be noted that the printable area is reset each time the form length is programmed, i.e. the printable area is then equal to the form length.

P r o g r a m m i n g f o r m l e n g t h :

IA No.5/ASCII	:	ESC	[	n	p
HEX.	:	1B	5B	n	7Ø
DEC.	:	Ø27	Ø91	n	112

"n" = 1 to 99 single-line (1/6") line spaces,
(convert for each decimal place)
"n" = Ø signifies resetting to setting as per strap W.28.1

Example: If instead of the full form length of 72 line spaces, a half-length form (36 line spaces) is to be handled, the control character sequence is as follows:

IA No.5/ASCII	:	ESC	[	3	6	p
HEX.	:	1B	5B	33	36	7Ø
DEC.	:	Ø27	Ø91	Ø51	Ø54	112

Immediately before the form length is programmed, a form feed (FF) must be programmed to advance the form to the top-of-form position.

Invalid entries (numbers greater than 99) cause an error message (smudge character) to be printed in the text. The previous programming remains valid.

Resetting to form length as per strap setting W28.1:

IA No.5/ASCII	:	ESC	[	p
HEX.	:	1B	5B	7Ø
DEC.	:	Ø27	Ø91	112

6.2.3.2 Printable area

The "printable area" is the area between the first and last printable line. In the initial status or after programming the form length, the form can be printed full length - as per strap setting W28.1 or as programmed in section 6.2.3.1).

The printer is set to the first printable line of the next form after each form feed via control character FF or after actuation of pushbutton FF LOC or when the end of the last printable line is passed. Formatting is achieved by programming the printable area. Single-line (1/6") line spaces are used for programming. Counting starts at the top-of-form position. The first and last print lines are to be programmed.

P r o g r a m m i n g f i r s t a n d l a s t p r i n t l i n e s :

IA No.5/ASCII	:	ESC	[	n1	;	n2	{
HEX.	:	1B	5B	n1	3B	n2	7B
DEC.	:	Ø27	Ø91	n1	Ø59	n2	123

"n1" = first printable line
"n2" = last printable line
"n1","n2" = 1 to 66 (72) or up to programmed form length
(convert for each decimal place)

Example: The printable area should be 51 single-line (1/6") line spaces and the base line of the first printable line should be spaced 1" = 6 single-line line spaces from the top of the paper.

The following control character sequence is used:

IA No.5/ASCII	:	ESC	[	6	;	5	6	{
HEX.	:	1B	5B	36	3B	35	36	7B
DEC.	:	Ø27	Ø91	Ø54	Ø59	Ø53	Ø54	123

The programmed function is performed ins response to the next control character character FF.

Control character FF causes form feed to the first print line of the printable area. If the first print line and the top-of-form position coincide, there is no form feed.

Invalid entries (first and last print lines are outside the available format) cause an error message (smudge character) to be printed in the text. The previous programming remains valid.

Resetting to the full form length (see above):

IA No.5/ASCII	:	ESC	[	{
HEX.	:	1B	5B	7B
DEC.	:	Ø27	Ø91	123

6.2.3.3 Line length

In the initial status the start-of-line and end-of-line contacts limit the line length. The position of these contacts is sampled in a synchronization run with "power ON" and after changing from the OFF-LINE mode to the ON-LINE mode. Start-of-line and end-of-line are freely selectable in 1/10" steps within these limits. The positions are counted starting from the first possible print position.

P r o g r a m m i n g s t a r t - o f - l i n e a n d
e n d - o f - l i n e :

IA No.5/ASCII	:	ESC	[	n1	;	n2	s
HEX.	:	1B	5B	n1	3B	n2	73
DEC.	:	Ø27	Ø91	n1	Ø59	n2	115

"n1" = position of first print position
"n2" = position of last print position
"n1","n2" = 1 to 132 character spaces of 1/10",
(convert for one, two or three digits)
"n2" must be greater than "n1"

Example: A width of 1", corresponding to 10 character spaces of 1/10", should be kept free as a margin at the left-hand edge of the paper. A space of 1/2", corresponding to 5 character spaces of 1/10", is sufficient at the right-hand edge. The maximum number of characters for the given paper width is 80 character spaces of 1/10". This corresponds to line length programming with 10 and 75 character spaces.

The following character sequence is required:

IA No.5/ASCII	:	ESC	[	1	Ø	;	7	5	s
HEX.	:	1B	5B	31	3Ø	3B	37	35	73
DEC.	:	Ø27	Ø91	Ø49	Ø48	Ø59	Ø55	Ø53	115

The programming becomes valid with the next line end criterion, the character sequence should therefore be followed by a control character CR.

Invalid entries (greater than the available line length) cause an error message (smudge character) to be printed in the text. The previous programming remains valid.

Resetting to the maximum possible line length (as per synchronization run):

IA No.5/ASCII	:	ESC	[	s
HEX.	:	1B	5B	73
DEC.	:	Ø27	Ø91	115

6.2.4 Character spacing

In the initial status, the two straps W28.6 and W28.7 determine the character spacing (see section 4.4.2). Starting from this initial status, two other character spacings can be programmed.

The following control character sequences activate:

Code	Standard print (1/1Ø")				Condensed print 1 (1/12")				Condensed print 2 (1/16.5")			
IA No.5/ASCII	ESC	[	1	w	ESC	[	2	w	ESC	[	4	w
HEX.	1B	5B	31	77	1B	5B	32	77	1B	5B	34	77
DEC.	Ø27	Ø91	Ø49	119	Ø27	Ø91	Ø5Ø	119	Ø27	Ø91	Ø52	119

The character spacing last programmed is always used. Invalid entries (incorrect figures) cause an error message (smudge character) to be printed in the text. The previous programming remains valid.

The character spacing can be changed from character to character. Spaces immediately before a change are suppressed, spaces after a change are executed. The character spacing cannot be changed immediately after a horizontal tabulator jump. A print character or a space must follow a tabulator jump if the character spacing is to be changed.
The print positions are always counted from the first print position of a line. The various print matrixes are fixed, with reference to the paper.

As an integral ratio is only seldom obtained when the character spacing is changed, the print must "lock" into the new matrix. There can thus be a spacing of 0 to 13 print columns of the new print matrix between the last print column of the last character in the old matrix and the first print column of the first character in the new matrix. (The relationship between print column and print character is described in sections 6.2.11 to 6.2.14.)

6.2.5 Line spacing and line feed

Line spacing is the space between the base lines of two successive print lines. In the initial status, the lines are single spaced (1/6"). Other line spacings can be programmed in quarter-line (1/24") units by means of control characters.

P r o g r a m m i n g l i n e s p a c i n g :

IA No.5/ASCII :	ESC	[	n	x
HEX. :	1B	5B	n	78
DEC. :	Ø27	Ø91	n	120

"n" = 1 to 99 in quarter-line (1/24") units, convert one or two digits
"n" = Ø causes resetting to single-line line spacing

Example: If instead of single-line line spacing, half-line line spacing is required, the change is made with the following control character sequence:

IA No.5/ASCII :	ESC	[	2	x
HEX. :	1B	5B	32	78
DEC. :	Ø27	Ø91	Ø5Ø	120

Paper feed takes place as programmed with the next line feed.

Line feed is initiated by the control characters:

IA No.5/ASCII :	LF
HEX. :	ØA
DEC. :	Ø1Ø

IA No.5/ASCII :	CR	only with strap W28.2 removed (section 4.4.2)
HEX. :	ØD	
DEC. :	Ø13	

Text exceeding the line length always initiates carriage return and line feed. As soon as one of these criteria is recognized by the control, the line is printed out and line feed follows. When the last valid print line is exceeded, form feed follows.

If a line end character is absent (CR, LF, FF), the line is printed out after approximately 8 seconds. When characters arrive, printing continues at the next print position.

Resetting to single-line paper feed:

IA No.5/ASCII	:	ESC	[	x
HEX.	:	1B	5B	78
DEC.	:	Ø27	Ø91	120

6.2.6 Underlining

The 12th (lowest) trace of the character matrix is used for underlining. Underlining is continuous from character to character including spaces, horizontal tabs and filler steps (see section 6.2.12).

Underlining ON:

IA No.5/ASCII	:	ESC	Ø
HEX.	:	1B	3Ø
DEC.	:	Ø27	Ø48

Underlining OFF:

IA No.5/ASCII	:	ESC	9
HEX.	:	1B	39
DEC.	:	Ø27	Ø57

6.2.7 Expanded print

Expanded print doubles the character width and thus the character spacing. Each matrix dot of a character is duplicated horizontally.

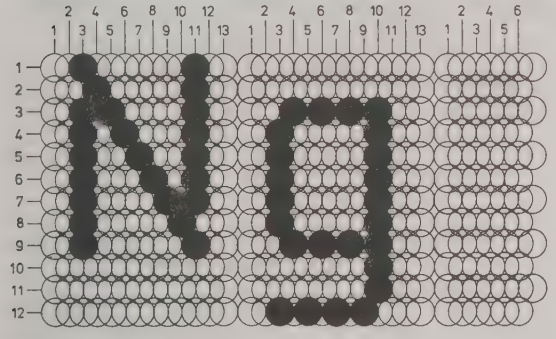


Fig. 6.2/1 Standard print

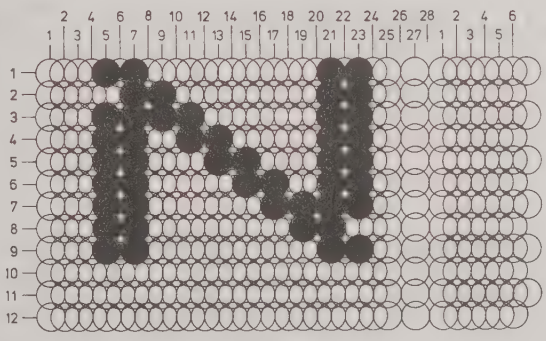


Fig. 6.2/2 Expanded print

The character N is shown in Fig. 6.2/1 in standard print, in Fig. 6.2/2 in expanded print. The following control character sequences switch expanded print on and off:

Expanded print ON:

IA No.5/ASCII	:	ESC	8
HEX.	:	1B	38
DEC.	:	Ø27	Ø56

Expanded print OFF:

IA No.5/ASCII	:	ESC	<
HEX.	:	1B	3C
DEC.	:	Ø27	Ø6Ø

All changes (character spacing, underlining ON/OFF and expanded print ON/OFF) can be made character-by-character.

6.2.8 Resetting character printing to initial status

The character sequence

IA No.5/ASCII	:	ESC	4
HEX.	:	1B	34
DEC.	:	Ø27	Ø52

resets character spacing and character set in accordance with the strap setting, expanded print and underlining also being reset.

6.2.9 Vertical tabulators

Two methods of vertical tabulation are possible - relative and absolute vertical tabulation.

Using relative vertical tabulation (initial status), the number of line spaces the paper must be advanced from its current position is specified (see Fig. 6.2/3).

Using absolute vertical tabulation, tabulator stops are set. Control character VT in the text causes paper feed to the next tabulator stop set (see Fig. 6.2/3).

The two tabulator types cannot be used together.

The left-hand side of Fig. 6.2/3 shows relative, the right-hand side absolute tabulator jumps.

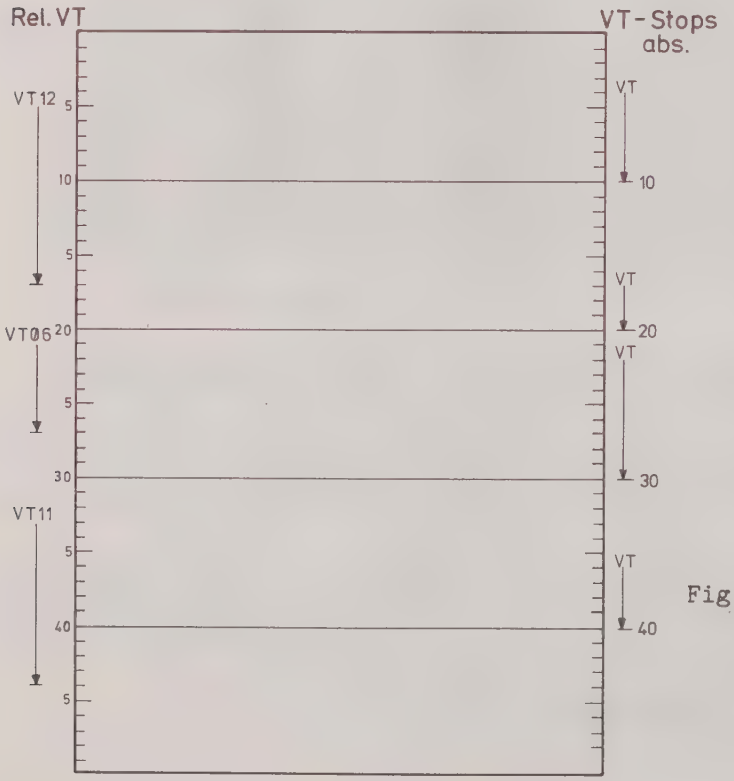


Fig. 6.2/3 Tabulator jumps with a number of single-line line spaces

6.2.9.1 Relative vertical tabulator

In the initial status, vertical tabulator jumps by a specified number of line spaces are performed in the line spacing set, starting from the current print line.

IA No.5/ASCII	:	VT	nn
HEX.	:	ØB	nn
DEC.	:	Ø11	nn

"nn" = Ø1 to 99
(always convert two places, including a zero in the tens place, if applicable)

After the arrival of the second digit, a tabulator jump by "nn" lines spaces is performed in the line spacing set (Fig. 6.2/3).

Example: With the control character sequence

IA No.5/ASCII	:	VT	Ø	7
HEX.	:	ØB	3Ø	37
DEC.	:	Ø11	Ø48	Ø55

7 lines spaces are jumped in the programmed line spacing.

- Tabulator jumps past the end of the form can be performed.
- If a tabulator jump should be made to a point outside the printable area, this is skipped and the vertical tabulation is completed in the next printable area.

6.2.9.2 Setting absolute vertical tabulator stops

Setting a tabulator stop causes switchover to absolute vertical tabulation. Up to 12 different vertical tabulator stops can be programmed. Counting is always in single-line (1/6") line spaces (irrespective of the line spacing set), starting from the top-of-form position. A tabulator jump is always made to the next-higher tabulator stop.

Programming tabulator stops:

IA No.5/ASCII	:	ESC	[	n1	;	n2	;	....	;	n12	r
HEX.	:	1B	5B	n1	3B	n2	3B	....	3B	n12	72
DEC.	:	Ø27	Ø91	n1	Ø59	n2	Ø59	...	Ø59	n12	114

"n1" = position of first tabulator stop
"n2" = position of second tabulator stop etc. to
"n12" = position of last tabulator stop
"n1"...."n12" = one or two digits

More than 12 stops and entries going past the form length are invalid.

Example: The control character VT should select the 10th line, the 20th line and the 30th line. The control character sequence is as follows:

IA No.5/ASCII	:	ESC	[	1	Ø	;	2	Ø	;	3	Ø	r
HEX.	:	1B	5B	31	3Ø	3B	32	3Ø	3B	33	3Ø	72
DEC.	:	Ø27	Ø91	Ø49	Ø48	Ø59	Ø50	Ø48	Ø59	Ø51	Ø48	114

The programmed tabulator function is initiated by the next control character VT. Invalid entries (more than 12 stops or stops going past the end of the form) cause an error message (smudge character) to be printed in the text. The previous programming remains valid.

A tabulator jump is performed on recognition of control character:

IA No.5/ASCII	:	VT
HEX.	:	ØB
DEC.	:	Ø11

The following conditions apply:

- The tabulator stops must be entered in ascending arithmetic sequence.
- Tabulator stops placed outside the printable area of a form are suppressed. In such cases no error message is printed.
- At least one tabulator stop must be set.
- No individual tabulator stops can be cleared or added. A change can be made by overwriting with a new set of tabulator stops.
- The tabulator jumps are performed in the sequence entered.

Resetting to the relative tabulator:

IA No.5/ASCII	:	ESC	[	4	g
HEX.	:	1B	5B	34	67
DEC.	:	Ø27	Ø91	Ø52	1Ø3

6.2.10 Horizontal tabulators

Three methods of horizontal tabulation are possible - relative, absolute or fixed horizontal tabulation.

Using relative horizontal tabulation (initial status), the number following the control character indicates the position from which printing is to be continued after the character last printed.

Example: HT ØØ7 indicates that 6 spaces are to be inserted, printing is thus to be continued with the 7th character.

Using absolute horizontal tabulation, the required tabulator stops are set in advance. These stops indicate the positions - after the control character HT - from which printing is to be continued.

The fixed tabulator can be activated in place of the relative tabulator by inserting strap W27.7 (section 4.4.1).

The tabulator types cannot be used together.

6.2.10.1 Relative horizontal tabulator

In the initial status, horizontal tabulator jumps by a specified number of print positions are performed in the character spacing set, starting from the current print position.

IA No.5/ASCII	:	HT	nnn
HEX.	:	Ø9	nnn
DEC.	:	ØØ9	nnn

"nnn" = ØØ1 to 233
convert three digits, including zeros in the tens and hundreds places)

A tabulator jump by "nnn" character spaces is performed in the valid character spacing after the third digit.

Example: With the control character sequence

IA No.5/ASCII	:	HT	Ø	1	5
HEX.	:	Ø9	30	31	35
DEC.	:	Ø9	Ø48	Ø49	Ø53

15 print positions are jumped in the character spacing set.

Invalid entries (e.g. jumps beyond the end of the line) cause an error message (smudge character) to be printed in the text.

6.2.10.2 Setting absolute horizontal tabulator stops

Setting a tabulator stop initiates switchover to absolute horizontal tabulation. Up to 12 different tabulator stops can be set. Counting always begins at the start of the line. A tabulator jump is always performed in the character spacing programmed.

Programming tabulator stops:

IA No.5/ASCII	:	ESC	[	n1	;	n2	; ...	;	n12	q
HEX.	:	1B	5B	n1	3B	n2	3B ...	3B	n12	71
DEC.	:	Ø27	Ø91	n1	Ø59	n2	Ø59 ...	Ø59	n12	113

"n1" = position of first tabulator stop
"n2" = position of second tabulator stop etc. to
"n12" = position of last tabulator stop
"n1"..."n12" = 1 to highest position on line (convert one to three digits)

- The positions refer to the nth print position of a line and are counted from the first position of the programmed line length in unit character spaces of the programmed character spacing (observe with expanded print). Tabulator stops set before programming are shifted accordingly.
- A character in expanded print requires 2 positions.
- More than 12 tabulator stops and entries exceeding the line length are invalid.
- A character spacing change is allowed up to a point directly before a tabulator jump.
- A character must follow a tabulator jump if the character spacing is to be changed.

Example: Tabulator positions should be selected which are 12, 24 and 36 character spaces from the start of the line. The control character sequence is as follows:

IA No.5/ASCII	:	ESC	[	1	2	;	2	4	;	3	6	q
HEX.	:	1B	5B	31	32	3B	32	34	3B	33	36	71
DEC.	:	Ø27	Ø91	Ø49	Ø50	Ø59	Ø50	Ø52	Ø59	Ø51	Ø54	113

The programmed tabulator jump is performed with the next control character HT. Invalid data (more than 12 stops) cause an error message (smudge character) to be printed in the text. The previous programming remains valid.

A tabulator jump is performed on recognition of control character

IA No.5/ASCII	:	HT
HEX.	:	Ø9
DEC.	:	ØØ9

The following conditions apply:

- Tabulator stops must be programmed in ascending arithmetic sequence.
- No individual stops can be cleared or added. A change can be made by overwriting with a new set of tabulator stops.
- A tabulator jump is always performed in the character spacing valid at the instant of the jump.
- The tabulator jumps are performed in the sequence of the entries, irrespective of the length of the text already printed.

  Example: The overwriting of a tabulator stop is followed by a jump to the next stop on the right.

- A tabulator stop with the value 1 has the effect of a carriage return.
- After calling up the last stop position on a line, printing continues on the same line starting from position "n1".
- If a line is terminated with a control character VT, FF or LF (but without CR), control character HT causes a jump to the relevant tabulator stop (e.g. to stop n5). If these control characters are combined with the control character CR (see straps W28.2 - W28.5), control character HT causes a jump to stop position n1.
- Tabulator jumps may not performed in the cas of expanded print.

Resetting to the relative tabulator:

IA No.5/ASCII	:	ESC	[	3	g
HEX.	:	1B	5B	33	67
DEC.	:	Ø27	Ø91	Ø51	1Ø3

6.2.10.3 Fixed horizontal tabulator

With strap W27.6 (section 4.4.1) inserted, the fixed horizontal tabulator replaces the relative tabulator. Each line is divided into blocks of eight characters. Starting from the first print position on the line, a tabulator stop is set at every 8th character.
On arrival of the control character HT (hex. Ø9), printing is continued at the next reachable tabulator stop. Overwritten stops are ignored.

6.2.11 Preset character generator

The Printer PT 80 i2 is equipped with a preset character generator offering the standard character set of the International Alphabet No.5 (IA No.5) and seven national character sets.

The character sets can be called up by means of control characters. The character set for the initial status is selected with straps (section 4.4.1). The following tables show the basic character set common to all configurations (Fig. 6.2/4) and the special characters that are different in the various character sets (Fig. 6.2/5).

Row Zeile / Column Spalte					b7	0	0	0	0	1	1	1	1
					b6	0	0	1	1	0	0	1	1
					b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1	HEX.		0	1	2	3	4	5	6	7
0	0	0	0	0	0	NUL	DLE	SP	0		P		p
0	0	0	1	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	3	ETX	DC3		3	C	S	c	s
0	1	0	0	4	4	EOT	DC4		4	D	T	d	t
0	1	0	1	5	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	A	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	B	11	VT	ESC	+	;	K		k	
1	1	0	0	C	12	FF	FS	,	<	L		l	
1	1	0	1	D	13	CR	GS	-	=	M		m	
1	1	1	0	E	14	SO	RS	.	>	N		n	
1	1	1	1	F	15	SI	US	/	?	O	_	o	DEL

Fig. 6.2/4 Standard code table (rows in decimal and hexadecimal notation)

The shaded table positions are assigned special characters, with are required by national standards (Fig. 6.2/5).

There is no response to the control characters marked with a diagonal line.

IA No.5 Spalte Column	Zeile Row	Hex.-Code	ASCII	Schwedisch, finnisch Swedish, finnish	Dänisch, norwegisch Danish, norwegian	Deutsch German	British British	Holländisch Dutch	Französisch, belgisch French, belgian	International
2	3	23	#	§	#	#	£	£	£	#
2	4	24	$	¤	¤	$	$	$	$	¤
4	0	40	@	É	É	§	@	@	à	@
5	11	5B	[	Ä	Æ	Ä	[	[	°	[
5	12	5C	\	Ö	Ø	Ö	\	\	ç	\
5	13	5D	]	Å	Å	Ü	]	]	§	]
5	14	5E	^	^	Ü	^	^	^	^	^
6	0	60	`	é	é	`	`	`	`	`
7	11	7B	{	ä	æ	ä	{	{	é	{
7	12	7C	|	ö	ø	ö	|	|	ù	|
7	13	7D	}	å	å	ü	}	}	è	}
7	14	7E	~	ü	ü	ß	¯	~	¨	¯

Fig. 6.2/5 Special characters (rows in decimal and hexadecimal notation)

The various configurations of the preset character generator are selected by means of the following control character sequences:

Character set	Code	Control character sequence			Remarks
International	IA No.5 HEX. DEC.	ESC 1B Ø27	(28 ØAØ	à 4Ø Ø64	
English (British)	IA No.5 HEX. DEC.	ESC 1B Ø27	(28 ØAØ	A 41 Ø65	
ASCII	IA No.5 HEX. DEC.	ESC 1B Ø27	(28 ØAØ	B 42 Ø66	
Danish/ Norwegian	IA No.5. HEX. DEC.	ESC 1B Ø27	(28 ØAØ	E 45 Ø69	
Swedish/ Finnish	IA No.5 HEX. DEC.	ESC 1B Ø27	(28 ØAØ	H 48 Ø72	
German	IA No.5 HEX. DEC.	ESC 1B Ø27	(28 ØAØ	K 4B Ø75	
French/ Belgian	IA No.5 HEX. DEC.	ESC 1B Ø27	(28 ØAØ	R 52 Ø82	
Dutch	IA No.5 HEX. DEC.	ESC 1B Ø27	(28 ØAØ	Ø 3Ø Ø48	
Resetting	IA No.5 HEX. DEC.	ESC 1B Ø27	= D3 Ø61		Resetting to programming straps W27.1; W27.2; W27.3
Resetting	IA No.5 HEX. DEC.	ESC 1B Ø27	4 34 Ø52		As above, but with resetting of character spacing, expanded print and underlining

6.2.12 Proportional spacing

Left-and-right margin justification can be achieved by inserting 1 to 13 filler steps of 1/7th character spacing between pairs of characters.

This function is activated by means of the control character sequence:

IA No.5/ASCII :	ESC	[	n	Space	E
HEX. :	1B	5B	n	20	45
DEC. :	027	091	n	032	069

"n" = number of filler steps inserted (1 to 13)
(convert one or two digits)
"n" = Ø signifies deactivation of function

Until the function is deactivated or changed, n filler steps of 1/7th character spacing are inserted between the characters to be printed.

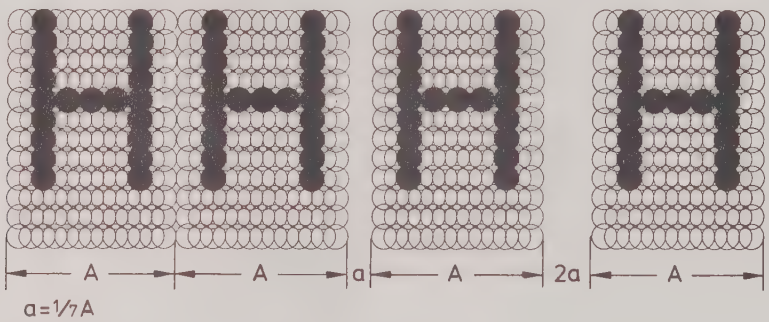


Fig. 6.2/6 Intercharacter spaces with proportional spacing

Example: Fig. 6.2/6 shows the letter H with three different intercharacter spaces. The first two characters are shown without filler steps. Between the second and the third characters o n e filler step "a" was inserted by means of the control character sequence:

IA No.5/ASCII :	ESC	[	1	Space	E
HEX. :	1B	5B	31	20	45
DEC. :	027	091	049	032	069

Between the third and fourth characters t w o filler steps "a" were inserted by means of the control character sequence:

IA No.5/ASCII :	ESC	[	2	Space	E
HEX. :	1B	5B	32	20	45
DEC. :	027	091	050	032	069

The intercharacter space is thus increased by 1/7 with each filler step inserted.

The programmed insertion is implemented with the next intercharacter space. Invalid entries ("n" greater than 13) cause an error message (smudge character) to be printed in the text. The previous programming remains valid. If filler steps expand the line until it is longer than the line length programmed, the filler steps in this line are suppressed.

The function is deactivated by means of the control character sequence:

IA No.5/ASCII :	ESC	[	Space	E
HEX. :	1B	5B	2Ø	45
DEC. :	Ø27	Ø91	Ø32	Ø69

6.2.13 Loadable character generator

The Printer PT 80 i2 is equipped with a loadable character generator for 95 customer-selectable characters and a space. These 96 characters must be loaded by the user via the interface. When the loadable character generator is activated by means of the control character sequence ESC 5, these characters can be called up - as is the case with the preset character generator - with the characters of the IA No.5 (ASCII Code).

The characters (Fig. 6.2/7) are built up within a dot matrix comprising 13 columns and 12 traces. All 13 columns can be used (Fig. 6.2/8). A 14th column is automatically assigned as an empty column. Each of the 12 dots in a column corresponds to a nozzle position.

A maximum of 9 columns should be assigned for single print characters, analogously to the preset character generator. The characters are placed in the middle of the dot matrix, so that the remaining columns are arranged evenly on either side of the character.

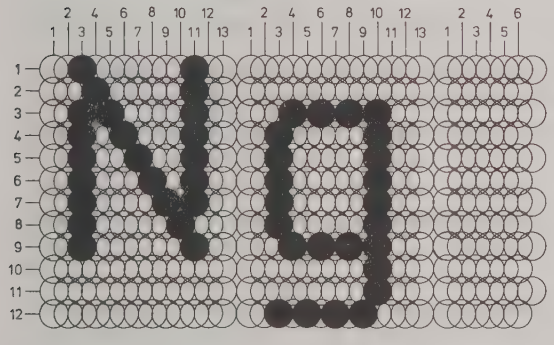


Fig. 6.2/7 (left) Characters of the preset character generator (upper and lower case characters)

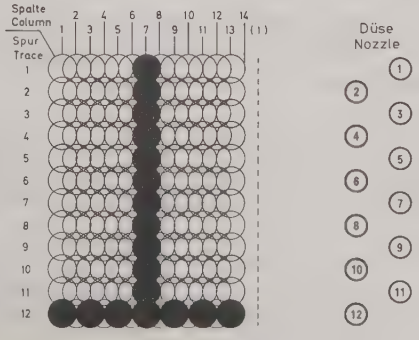


Fig. 6.2/8 (right)
Assignment of a large-area character symbol in the matrix. The nozzle arrangement should reflect its assignment to the traces. The displacement of the nozzle rows shown is understood to be the projection of the nozzles onto the paper to be printed

At least one empty column must always be programmed between two dots of a trace (as seen from trace 12 of the example in Fig. 6.2/8). The column (14) after column 13 is an automatically inserted empty column, which need not be allowed for during programming.

The loadable character generator is reset with "power OFF" or a power outage.

Switchover to loadable character generator:

IA No.5/ASCII	:	ESC	5
HEX.	:	1B	35
DEC.	:	Ø27	Ø53

Reset to preset character generator:

IA No.5/ASCII	:	ESC	=
HEX.	:	1B	3D
DEC.	:	Ø27	Ø61

The complete contents of the character generator must always be loaded in one operation. Individual characters cannot be loaded or changed. If it is necessary to make changes, the complete contents must be overwritten.

Activate programming of loadable character generator:

IA No.5/ASCII	:	ESC	[	t
HEX.	:	1B	5B	74
DEC.	:	Ø27	Ø91	116

The 12 dots of a print column are distributed among two programming bytes as follows:

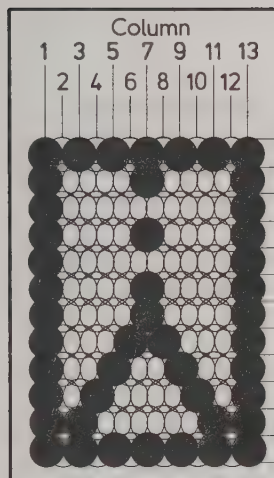
Bit	1	2	3	4	5	6	7	8	
Byte 1	1st	3rd	5th	7th	9th	11th			dot (trace)
Byte 2	2nd	4th	6th	8th	10th	12th			dot (trace)

Bits 7 and 8 of the programming bytes are not assigned and can be loaded with Ø or 1. The 13 columns of a character position thus require 26 bytes. These 96 x 26 = 2496 bytes are now entered in sequence until each print column position is assigned.

Of these 2496 bytes, bytes 1 to 26 must be programmed with zeros. This character corresponds to the space in the IA No.5.

The printer automatically deactivates programming after acceptance of the last byte. All data subsequently entered are interpreted as normal print or control characters.

Fig. 6.2/9 shows as an example the assignment of a graphic character in the print matrix and Fig. 6.2/10 shows the assignment of the bytes to the character (storage) positions. A "1" corresponds to an ink dot and a "0" remains free.



Byte	Column 1		2		3		4		5		6		7		8		9		10		11		12		13	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Bit 1	1		0		1		0		1		0		1		0		1		0		1		0		1	
		1		0		0		0		0		0		1		0		0		0		0		0		1
Bit 2	1		0		0		0		0		0		0		0		0		0		0		0		1	
		1		0		0		0		0		0		1		0		0		0		0		0		1
Bit 3	1		0		0		0		0		0		0		0		0		0		0		0		1	
		1		0		0		0		0		0		1		0		0		0		0		0		1
Bit 4	1		0		0		0		0		0		1		0		0		0		0		0		1	
		1		0		0		0		0		1		0		1		0		0		0		0		1
Bit 5	1		0		0		0		1		0		0		0		1		0		0		0		1	
		1		0		0		1		0		0		0		0		0		1		0		0		1
Bit 6	1		0		1		0		0		0		0		0		0		0		1		0		1	
		1		0		1		0		1		0		1		0		1		0		1		0		1
Bit 7	0		0		0		0		0		0		0		0		0		0		0		0		0	
		0		0		0		0		0		0		0		0		0		0		0		0		0
Bit 8	0		0		0		0		0		0		0		0		0		0		0		0		0	
		0		0		0		0		0		0		0		0		0		0		0		0		0

Fig. 6.2/9 Example for the assignment of a graphic character

								0	0	0	0	1	1	1	1
								0	0	1	1	0	0	1	1
								0	1	0	1	0	1	0	1
b_7	b_6	b_5	b_4	b_3	b_2	b_1	Row \ Column	0	1	2	3	4	5	6	7
			0	0	0	0	0	0		Byte * 1 – 26	Byte 417 – 442	Byte 833 – 858	Byte 1249 – 1274	Byte 1665 – 1690	Byte 2081 – 2106
			0	0	0	1	1	1		27 – 52	443 – 468	859 – 884	1275 – 1300	1691 – 1716	2107 – 2132
			0	0	1	0	2	2		53 – 78	469 – 494	885 – 910	1301 – 1326	1717 – 1742	2133 – 2158
			0	0	1	1	3	3		79 – 104	495 – 520	911 – 936	1327 – 1352	1743 – 1768	2159 – 2184
			0	1	0	0	4	4		105 – 130	521 – 546	937 – 962	1353 – 1378	1769 – 1794	2185 – 2210
			0	1	0	1	5	5		131 – 156	547 – 572	963 – 988	1379 – 1404	1795 – 1820	2211 – 2236
			0	1	1	0	6	6		157 – 182	573 – 598	989 – 1014	1405 – 1430	1821 – 1846	2237 – 2262
			0	1	1	1	7	7		183 – 208	599 – 624	1015 – 1040	1431 – 1456	1847 – 1872	2263 – 2288
			1	0	0	0	8	8		209 – 234	625 – 650	1041 – 1066	1457 – 1482	1873 – 1898	2289 – 2314
			1	0	0	1	9	9		235 – 260	651 – 676	1067 – 1092	1483 – 1508	1899 – 1924	2315 – 2340
			1	0	1	0	A	10		261 – 286	677 – 702	1093 – 1118	1509 – 1534	1925 – 1950	2341 – 2366
			1	0	1	1	B	11		287 – 312	703 – 728	1119 – 1144	1535 – 1560	1951 – 1976	2367 – 2392
			1	1	0	0	C	12		313 – 338	729 – 754	1145 – 1170	1561 – 1586	1977 – 2002	2393 – 2418
			1	1	0	1	D	13		339 – 364	755 – 780	1171 – 1196	1587 – 1612	2003 – 2028	2419 – 2444
			1	1	1	0	E	14		365 – 390	781 – 806	1197 – 1222	1613 – 1638	2029 – 2054	2445 – 2470
			1	1	1	1	F	15		391 – 416	807 – 832	1223 – 1248	1639 – 1664	2055 – 2080	2471 – 2496

Fig. 6.2/10 Relationship between the table positions of the IA No.5, the associated storage positions of the character generator and the byte number areas per storage position.

* Bytes 1 to 26 must be programmed with 0000 0000 (HEX.: 00).

6.2.14 Graphics printing

Individual selection of the nozzles makes the Printer PT 80 i2 capable of printing graphics using either the scanner printing method or the bit-image printing method. Printing takes place during the forward movement of the printer carriage only (from left to right). Only traces 1 to 7 of the 12 nozzle traces are used for graphics printing.
With half-line line feed, continuous black printing in the vertical direction is implemented in the seven traces printed during the forward movement of the carriage.

On switchover to graphics printing, the following parameters remain valid:

- Form length
- Printable area (first and last print line)
- Line length (first and last print position)
- Line spacing
- Character spacing

Via the character spacing, the horizontal dot density (dpi) can be selected. With 1/10" character spacing, double dot density can be activated by means of control characters.

6.2.14.1 Control character recognition

Bit 8 is used to indicate whether information or control characters are transmitted. The parity check is automatically deactivated with graphics printing.

Bit 8 = low (Ø)	Bits 1 to 7 are interpreted as control character
Bit 8 = high (1)	Bits 1 to 7 are interpreted as information character

During graphics printing, only a limited number of control characters may be used. These control characters or control character sequences are:

ESC c	Reset printer to initial status
CR	Carriage return
LF	Line feed
FF	Form feed
	With bit-image printing
ESC [n Space r	- Position print head
ESC [n1 ; n2 v	- Print repetition
ESC [-	Graphics printing OFF

Character spacing and/or line spacing changes or other parameter changes must therefore always be made b e f o r e switching over to graphics printing.

6.2.14.2 Scanner method

The print information is transmitted byte by byte in bit-serial form. The transmitted information corresponds to (horizontal) single traces. As soon as the information contents of all 7 traces have arrived, the characters are printed out column by column in 7 traces during the forward movement of the carriage. Fig. 6.2/11 shows the schematic sequence of functions of the scanner method during data transmission.

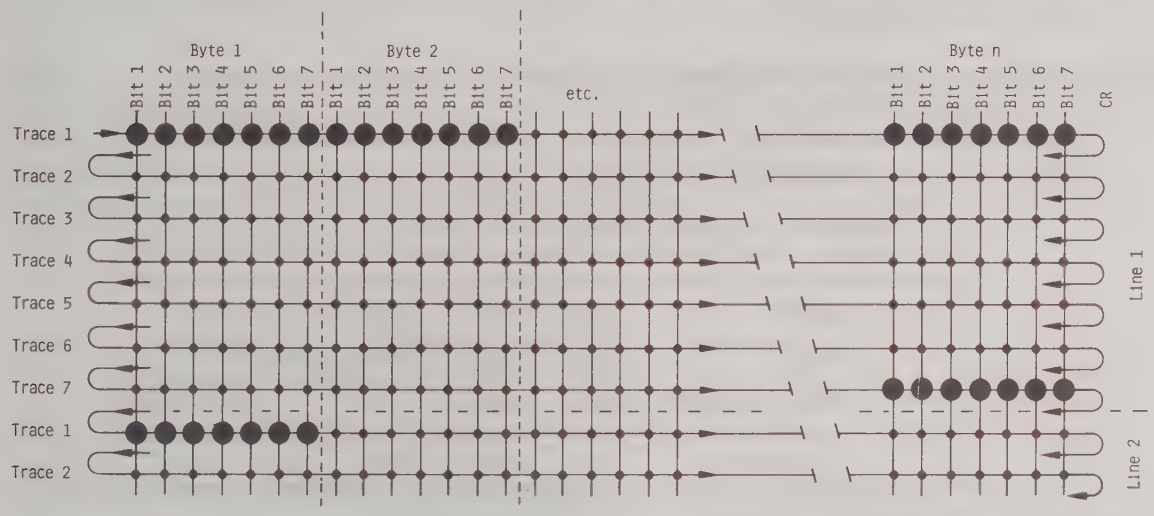


Fig. 6.2/11 Schematic sequence of functions of the scanner method during character transmission

In the scanner mode, all character spacings that can be selected are possible. The 1/10" character spacing can be expanded to double dot density by means of control characters. The following table shows the relationship between dot density and character spacing. It states the maximum number of dots when 9 7/8" (250 mm) wide paper is used. The values in brackets apply to 14 7/8" (377.8 mm) wide paper.

Character spacing	Normal density	Double density
1/10"	560 (924) dots/trace 70 dpi 1*)	1120 (1848) dots/trace 140 dpi
1/12"	672 (1106) dots/trace 84 dpi 2*)	———
1/16.5"	924 (1526) dots/trace 115 dpi	———

1*) dpi = dots per inch
2*) It is possible to generate a square matrix with 1/84" dot spacing. (In the square matrix, column and trace spacing is identical.)

The following must be observed with the scanner method:

- Every trace must be closed with the control character CR.
- The seven traces of a line must be of equal length. The first trace determines the trace length within a line. If the following traces are longer than the first, their length is automatically limited. If the following traces are shorter than the first, they must be filled up.
- Successive l i n e s may be of different length.
- Printing is initiated when the 7th trace is closed with the control characters CR and LF.

The scanner mode is activated with the control character sequence:

IA No.5/ASCII	ESC	[	|	Normal density
HEX.	1B	5B	7C	
DEC.	Ø27	Ø91	124	

IA No.5/ASCII	ESC	[	}	Double density
HEX.	1B	5B	7D	Only with 1/10" character spacing
DEC.	Ø27	Ø91	125	

A character printing/scanner mode switchover can be only made from line to line (with bit-image printing, also within a line).
For continuous black printing in the vertical direction, half-line line feed must be programmed.
Character spacing and line spacing must always be programmed b e f o r e switchover to the scanner mode.

The scanner mode is deactivated with the control character sequence:

IA No.5:	ESC	[	-
ASCII :	ESC	[	~
HEX. :	1B	5B	7E
DEC. :	Ø27	Ø91	126

After deactivation of the scanner mode, the printer remains set to the character spacing and line spacing selected for this mode.

If the character spacing and/or line spacing are to be changed, they must be newly programmed.

Example: It is intended to switch over from character printing with 1/10" character spacing and single-line line spacing to scanner printing with 1/12" character spacing (84 dpi) and half-line line spacing. After printout of the scanner printing data, switchover to character printing with 1/10" character spacing and single-line line spacing is to be made.

The control character sequences in this case are as follows:

ESC [2 w Character spacing 1/12 "	ESC [2 x Line spacing half-line	ESC [I Raster scan normal density	..... Raster scan Data
ESC [¯ Raster scan OFF	ESC [4 x Line spacing single-line	ESC [1 w Character spacing 1/10"	..... Character printing Data

6.2.14.3 Bit-image method

Nozzles 1 to 7 of the ink-jet print head are controlled directly via the interface by corresponding bytes. Each byte transmitted therefore corresponds to a 7-print position print column. Fig. 6.2/12 shows the ink-jet nozzle/data bit assignment. Fig. 6.2/13 shows the bit-image printing principle. The printer control compensates for the mechanical spacing of the two nozzle columns by providing an appropriate offset in time on nozzle activation.

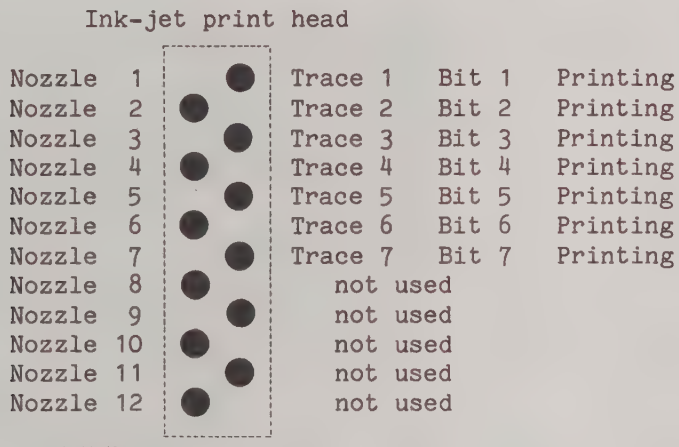


Fig. 6.2/12
Trace/data bit assignment

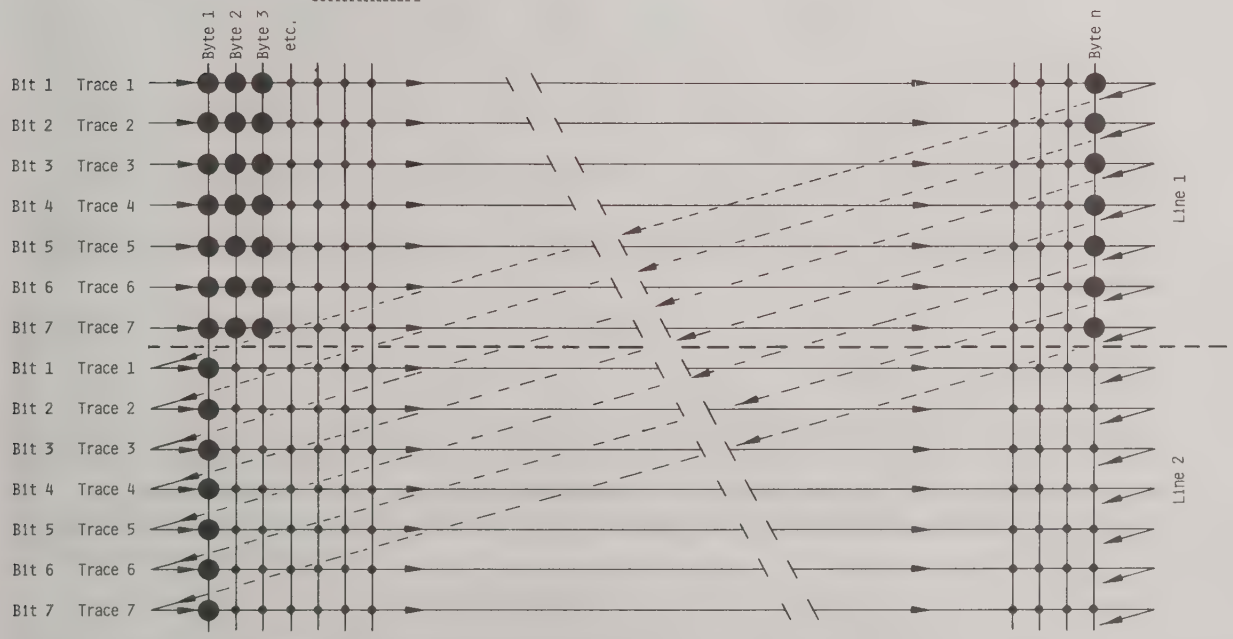


Fig. 6.2/13 Bit-image printing principle

With bit-image printing all character spacings that can be set are possible. The 1/10" character spacing is expandable to double dot density. The following table shows the relationship between dot density and character spacing. It states the maximum number of print columns when 9 7/8" (250 mm) wide paper is used [the values in brackets apply to 14 7/8" (377.8 mm) wide paper].

Character spacing	Normal density	Double density
1/10"	560 (924) columns/line 70 dpi 1*)	1120 (1848) columns/line 140 dpi
1/12"	672 (1106) columns/line 84 dpi 2*)	——
1/16.5"	924 (1526) columns/line 115.5 dpi	——

1*) dpi = dots per inch
2*) It is possible to generate a square matrix with 1/84" dot spacing.

Bit-image printing is activated by means of the control character sequences:

IA No.5/ASCII	ESC	[	y	Normal density
HEX.	1B	5B	79	
DEC.	Ø27	Ø91	121	

IA No.5/ASCII	ESC	[	z	Double density
HEX.	1B	5B	7A	Only with 1/10" character spacing
DEC.	Ø27	Ø91	122	

For continuous black printing, half-line (2 x 1/24") line spacing must be programmed.

Character spacing and line spacing must always be programmed b e f o r e switchover to bit-image printing (see sections 6.2.4 and 6.2.5).

Bit-image printing must be deactivated before switching over from normal to double density.

Print head positioning

In a similar manner to tabulation with character printing, for start or continuation of printout the print head can be positioned with bit-image printing at a defined print column along a line by means of control characters. Positioning to a print column is always relative to the programmed start of the line.

Position print head:

IA No.5/ASCII	:	ESC	[	n	Space	r
HEX.	:	1B	5B	n	20	72
DEC.	:	027	091	n	032	114

"n" = column 1 to last column of the line
(convert one to four digits)

Note: - If n is greater than is allowed by the available line length, the command is disregarded

- With double density, n must be selected as with normal density.

Example: With the control character sequence

IA No.5/ASCII	:	ESC	[	2	0	0	Space	r
HEX.	:	1B	5B	32	30	30	20	72
DEC.	:	027	091	050	048	048	032	114

printing is started or continued with the 200th print column (normal density), irrespective of normal or double density printing.

Repetition of print information

With bit-image printing, the repetition of a print section (within a line) can be made easier by means of special control character sequences.

The repetition function is activated by means of the control character sequence:

IA No.5/ASCII	:	ESC	[	n1	;	n2	v
HEX.	:	1B	5B	n1	3B	n2	76
DEC.	:	027	091	n1	059	n2	118

"n1" indicates how often the print section made up of n2 print columns must be repeated

"n2" is the number of the print columns to be repeated n1 times. The appropriate print column information must then arrive after the control character sequence mentioned above.

Condition is that n1 x n2 is not greater than allowed by the available line length. Repeated data which extend beyond the end of the line are lost.

Example: With the control character sequence:

IA No.5/ASCII	:	ESC	[	2	2	;	1	0	v
HEX.	:	1B	5B	32	32	3B	31	30	76
DEC.	:	027	091	050	050	059	049	048	118

the 10 print columns whose data arrive after this control character sequence are printed 22 times.

6.2.14.4 Switchover between character printing and bit-image printing

Within a line it is possible to switch between character printing with various character spacings and bit-image printing with various dot densities.

The following must be observed:

- B e f o r e programming new print parameters bit-image printing must be deactivated.
- On switchover from bit-image printing to character printing the change always takes effect at the first print column of the character which, in the corresponding character spacing *), follows the last print column of bit-image printing.
- On switchover from character printing to bit-image printing the change always takes effect at the first print column of the next character.
- On switchover between the individual dot densities with bit-image printing the change always takes effect at the next possible print column of the new dot density *).
- Space characters received between characters and the activation of the bit-image mode are supppressed during printout.

Bit-image printing is deactivated with the control character sequence:

IA No.5:	ESC	[	¯
ASCII	:	ESC	[	~
HEX.	:	1B	5B	7E
DEC.	:	Ø27	Ø91	126

After deactivation of the bit-image printing mode the printer remains set to the character spacing and line spacing selected for this mode. If the character spacing and/or line spacing are to be changed, they must be newly programmed.

Example: It is intended to switch over from character printing with 1/10" character spacing and single-line line spacing to bit-image printing with 1/12" character spacing (84 dpi) and half-line line spacing. After printout of the bit-image data, switchover to character printing with 1/10" character spacing and single-line line spacing is to be made.

These are the appropriate control character sequences for this case:

ESC [2 w	ESC [2 x	ESC [y	.....
Character spacing 1/12"	Line spacing half-line	Bit image printing normal density	Bit image printing Data
ESC [¯	ESC [4 x	ESC [1 w	.....
Bit image printing OFF	Line spacing single-line	Character spacing 1/10"	Character printing Data

*) The characters with character printing and the print columns with bit-image printing are always counted from the first print position (start of line). The positions are thus fixed, with reference to the paper. However, as there is only seldom an integral relationship on switchover between the individual matrices, the print head must "lock into" the new matrix.

6.2.15 Control characters

6.2.15.1 Treatment of control characters

When a control character sequence is recognized as errored, an error message (small smudge character ▒) is printed in the text. Parity errors are indicated by a large smudge character (▓).

Print position displacements are compensated for by automatic execution of the new line function at the end of a line. The last control character sequence recognized as correct remains valid. No characters are lost and printing is not suppressed following printout of the smudge character.

Control characters of the IA No. 5 which are not used by the printer do not cause a control response. Characters, which are print characters in an unrecognizable control character sequence, are printed in the text.

▌Example: Errored reception: Entry: ESC Y ABC Printing: ▒ Y ABC

Control characters which are only valid with character printing or only valid with graphics printing may not be used in the other printing method.

6.2.15.2 Printing control characters

When strap W28.8 (section 4.4.2) is not inserted, alternate symbols (characters) are printed for all control characters. For the control characters CR, LF, FF, HT and VT only the symbol is printed, the command is not however executed. If the print area is exceeded, the printer automatically performs line feed and form feed. The symbols used are selected and converted as per the International Alphabet No.5 (ASCII Code) as follows:

Control character of column Ø - underlined information character of column 2

Control character of column 1 - underlined information character of column 3

▌Examples VT = + BS = (ESC = ; DC4 = 4

(Data flow control with DC1/DC3 is ineffective.)

b7	b6	b5	b4	b3	b2	b1	Row \ Column	0	1	2	3	4	5	6	7
								0	0	0	0	1	1	1	1
								0	0	1	1	0	0	1	1
								0	1	0	1	0	1	0	1
			0	0	0	0	0	NUL	DLE	SP	0	@(§)	P	`	p
			0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
			0	0	1	0	2	STX	DC2	"	2	B	R	b	r
			0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
			0	1	0	0	4	EOT	DC4	¤($)	4	D	T	d	t
			0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
			0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
			0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
			1	0	0	0	8	BS	CAN	(	8	H	X	h	x
			1	0	0	1	9	HT	EM	)	9	I	Y	i	y
			1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
			1	0	1	1	11	VT	ESC	+	;	K	[	k	{
			1	1	0	0	12	FF	FS	,	<	L	\	l	|
			1	1	0	1	13	CR	GS	-	=	M	]	m	}
			1	1	1	0	14	SO	RS	.	>	N	^	n	~
			1	1	1	1	15	SI	US	/	?	O	_	o	DEL

Fig. 6.2/14
Code table of the IA No.5. The control characters scored out with a diagonal stroke are control characters of the IA No.5 which are not used by the Printer PT 80 i2

Control character function	Control character sequences	Remarks
Reset printer to initial status	IA No.5 ESC c HEX. 1B 63 DEC. Ø27 Ø99	Section 6.2.2
Bell	IA No.5 BEL HEX. Ø7 DEC. Ø07	
X-ON (printer ready to receive)	IA No.5 DC1 HEX. 11 DEC. Ø17	Section 7.1
X-OFF (printer not ready to receive)	IA No.5 DC3 HEX. 13 DEC. Ø19	
Request device identification (is received by Printer PT 80 i2)	IA No.5 ESC [C HEX. 1B 5B 43 DEC. Ø27 Ø91 Ø67	
Device identification - transmitted by Printer PT 80 i2 in response to ESC [C	IA No.5 ESC [? s HEX. 1B 5B 3F 73 DEC. Ø27 Ø91 Ø63 115	For printer identification
End of text block	IA No.5 ETX HEX. Ø3 DEC. Ø03	
Text block closed with ETX was printed - is transmitted by Printer PT 80 i2	IA No.5 ACK HEX. Ø6 DEC. Ø06	
Form feed	IA No.5 FF HEX. ØC DEC. Ø12	Strap setting Section 4.4.2
Carriage return	IA No.5 CR HEX. ØD DEC. Ø13	
New line CR = CR and LF	IA No.5 CR HEX. ØD DEC. Ø13	
New line LF = LF and CR	IA No.5 LF HEX. ØA DEC. Ø1Ø	
Line feed	IA No.5 LF HEX. ØA DEC. Ø1Ø	
Program line spacing in 1/4-line (1/24") units	IA No.5 ESC [n x HEX. 1B 5B n 78 DEC. Ø27 Ø91 n 12Ø	n = number of units for one line feed Section 6.2.5
Reset line spacing	IA No.5 ESC [x HEX. 1B 5B 78 DEC. Ø27 Ø91 12Ø	Single-line line spacing
Program form length in single-line (1/6") line spacings	IA No.5 ESC [n p HEX. 1B 5B n 7Ø DEC. Ø27 Ø91 n 112	n = no. of line spaces n = Ø means resetting Section 6.2.3.1
Reset form length	IA No.5 ESC [p HEX. 1B 5B 7Ø DEC. Ø27 Ø91 112	Form length as per strap setting W28.1 Section 4.4.2

The characters of the IA No.5 used here are identical to the characters of the ASCII, unless otherwise specified

Control character function	Control character sequences	Remarks
Program line length in 1/10" character spacing (start and end of line)	IA No.5 ESC [n1 ; n2 s HEX. 1B 5B n1 3B n2 73 DEC. Ø27 Ø91 n1 Ø59 n2 115	n1 = 1st print position n2 = last print position Section 6.2.3.3
Reset line length	IA No.5 ESC [s HEX. 1B 5B 73 DEC. Ø27 Ø91 115	As per synchronization run
Vertical tabulator (relative tabulation)	IA No.5 VT nn HEX. ØB nn DEC. Ø11 nn	nn = no. of line spaces for one tabulator jump Section 6.2.9
Program up to 12 vertical tabulator stops in single-line (1/6") line spacing	IA No.5 ESC [n1 ; ... ; n12 r HEX. 1B 5B n1 3B ... 3B n12 72 DEC. Ø27 Ø91 n1 Ø59 ... Ø59 n12 114	n1 ... n12 = position of tabulator marks Section 6.2.9
Initiate tabulator jump	IA No.5 VT HEX. ØB DEC. Ø11	Only when tabulator stops are programmed
Reset vertical tabulator (clear tabulator stops)	IA No.5 ESC [4 g HEX. 1B 5B 34 67 DEC. Ø27 Ø91 Ø52 1Ø3	Resetting to relative tabulator Section 6.2.9
Program first/last printable line in single-line (1/6") line spacing (for forms)	IA No.5 ESC [n1 ; n2 { HEX. 1B 5B n1 3B n2 7B DEC. Ø27 Ø91 n1 Ø59 n2 123	n1 = 1st print line n2 = last print line within format - Sect.6.2.3.2
Reset first/last print line	IA No.5 ESC [{ HEX. 1B 5B 7B DEC. Ø27 Ø91 123	Resetting to programmed form length
Backspace	IA No.5 BS HEX. Ø8 DEC. Ø08	
Space	IA No.5 SP HEX. 20 DEC. Ø32	
Horizontal tabulator (relative tabulation)	IA No.5 HT nnn HEX. Ø9 nnn DEC. Ø09 nnn	nnn = number of print positions for one tabulator jump
Program up to 12 horizontal tabulator stops in line spacing set	IA No.5 ESC [n1 ; ... ; n12 q HEX. 1B 5B n1 3B ... 3B n12 71 DEC. Ø27 Ø91 n1 Ø59 ... Ø59 n12 113	n1 ... n12 = positions of tabulator stops Section 6.2.10
Trip tabulator jump	IA No.5 HT HEX. Ø9 DEC. Ø09	Only when tabulator stops are programmed
Reset horizontal tabulator (clear tabulator stops)	IA No.5 ESC [3 g HEX. 1B 5B 33 67 DEC. Ø27 Ø91 Ø51 1Ø3	Resetting to relative tabulator Section 6.2.10
Reset character printing	IA No.5 ESC 4 HEX. 1B 34 DEC. Ø27 Ø52	Section 6.2.8
Switchover to loadable character generator	IA No.5 ESC 5 HEX. 1B 35 DEC. Ø27 Ø53	Section 6.2.13
Resetting to preset character generator without character spacing change	IA No.5 ESC = HEX. 1B 3D DEC. Ø27 Ø61	

Control character function	Control character sequences	Remarks
Preset character generator: International configuration	IA No.5 ESC (@ HEX. 1B 28 40 DEC. 027 040 064	Section 6.2.11
English configuration	IA No.5 ESC (A HEX. 1B 28 41 DEC. 027 040 065	
ASCII configuration	IA No.5 ESC (B HEX. 1B 28 42 DEC. 027 040 066	
Danish/Norwegian configuration	IA No.5 ESC (E HEX. 1B 28 45 DEC. 027 040 069	
Swedish/Finnish configuration	IA No.5 ESC (H HEX. 1B 28 48 DEC. 027 040 072	
German configuration	IA No.5 ESC (K HEX. 1B 28 4B DEC. 027 040 075	
French/Belgian configuration	IA No.5 ESC (R HEX. 1B 28 52 DEC. 027 040 082	
Dutch configuration	IA No.5 ESC (Ø HEX. 1B 28 30 DEC. 027 040 048	
Load loadable character generator	IA No.5 ESC [t HEX. 1B 5B 74 DEC. 027 091 116	Section 6.2.13
Character spacing 1/10"	IA No.5 ESC [1 w HEX. 1B 5B 31 77 DEC. 027 091 049 119	Setting for the initial status Section 6.2.4
Character spacing 1/12"	IA No.5 ESC [2 w HEX. 1B 5B 32 77 DEC. 027 091 050 119	
Character spacing 1/16.5"	IA No.5 ESC [4 w HEX. 1B 5B 34 77 DEC. 027 091 052 119	
Proportional spacing with n filler steps ON	IA No.5 ESC [n SP E HEX. 1B 5B n 20 45 DEC. 027 091 n 032 069	n = number of filler steps; n = Ø signifies function OFF
Proportional spacing OFF	IA No.5 ESC [SP E HEX. 1B 5B 20 45 DEC. 027 091 032 069	Section 6.2.12
Underlining ON	IA No.5 ESC Ø HEX. 1B 30 DEC. 027 048	Section 6.2.6
Underlining OFF	IA No.5 ESC 9 HEX. 1B 39 DEC. 027 057	
Expanded print ON	IA No.5 ESC 8 HEX. 1B 38 DEC. 027 056	Section 6.2.7
Expanded print OFF	IA No.5 ESC < HEX. 1B 3C DEC. 027 060	

Control character function	Control character sequences	Remarks
Scanner method normal dot density ON	IA No.5 ESC [HEX. 1B 5B 7C DEC. Ø27 Ø91 124	Section 6.2.14.2
Scanner method double dot density ON	IA No.5 ESC [HEX. 1B 5B 7D DEC. Ø27 Ø91 125	
Bit-image printing normal dot density ON	IA No.5 ESC [y HEX. 1B 5B 79 DEC. Ø27 Ø91 121	
Bit-image printing double dot density ON	IA No.5 ESC [z HEX. 1B 5B 7A DEC. Ø27 Ø91 122	
Print head positioning with bit-image printing	IA No.5 ESC [n SP r HEX. 1B 5B n 2Ø 72 DEC. Ø27 Ø91 n Ø32 114	n = position of print column from start of line
Bit-image printing repeat print information	IA No.5 ESC [n1 ; n2 ; v HEX. 1B 5B n1 35 n2 35 76 DEC. Ø27 Ø91 n1 Ø59 n2 Ø59 118	n1 = number of repeats n2 = number of print columns to be repeated
Scanner and bit-image printing OFF (graphics printing OFF)	IA No.5 ESC [_ ASCII ESC [~ HEX. 1B 5B 7E DEC. Ø27 Ø91 126	

Control characters which are not used:

The Printer PT 80 i2 does n o t respond to these control characters. When control character printing is selected (section 6.2.15), the printer only prints the alternate characters

IA No.5	HEX.	DEC.
NUL	ØØ	ØØØ
SOH	Ø1	ØØ1
STX	Ø2	ØØ2
EOT	Ø4	ØØ4
ENQ	Ø5	ØØ5
SO	ØE	Ø14
SI	ØF	Ø15
DLE	1Ø	Ø16
DC2	12	Ø18
DC4	14	Ø2Ø
NAK	15	Ø21
SYN	16	Ø22
ETB	17	Ø23
CAN	18	Ø24
EM	19	Ø25
SUB	1A	Ø26
IS4 (FS)	1C	Ø28
IS3 (GS)	1D	Ø29
IS2 (RS)	1E	Ø3Ø
IS1 (US)	1F	Ø31

6.2.16 Parity check

In the character printing mode of the Printer PT 80 i2, the parity of the received data can be checked or not checked. In operation with parity check, even or odd parity can be selected. (For the parity check in the printer, the transmitting station supplements each 7-bit character with an 8th bit so that the number of "1" bits of each character is an even number (even parity) or an odd number (odd parity).

The operating mode is set with the programming straps W29.1 and W29.2 on the basic electronics board (see section 4.4.3 "Programming strap settings"). With graphics printing and when the loadable character generator is loaded, no parity check is possible.

6.2.16.1 Operation without parity check

In this operating mode, the parity of the received data and control characters is not checked.

The parity bit contained in the acknowledgements transmitted by the printer is set to Ø or 1 (section 4.4.3)

6.2.16.2 Operation with parity check

In this operating mode, the parity of the received data and control characters is checked. The parity can be set to even or odd parity.

If a data or control character is found to have the incorrect parity, a large smudge character ▒ is printed.

There is no further response by the printer control to control characters with incorrect parity.

7 Printer interfaces

The Printer PT 80 i2 is equipped for connection to a transmitting station with the following interfaces:

- CCITT V.24/V.28 and EIA Standard RS-232-C
  or TTY (20-mA Current Loop) for bit-serial data transfer
- Centronics®-type for bit-parallel data transfer

The connectors for the serial and parallel interfaces are located on the basic electronics board GE-MC3 (see also Fig. 4/24 in section 4.4).

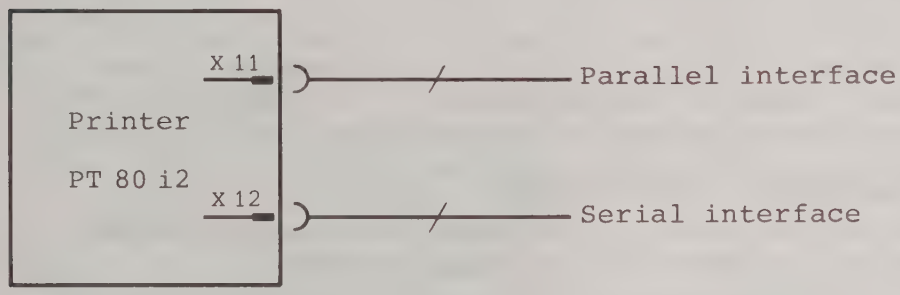


Fig. 7/1 Printer PT 80 i2 interfaces

When data are transferred bit-serially, the elements of a character are transmitted in turn over the transmission line. The start-stop method is used for character transmission, i.e. each 7-bit combination begins with a start element and is terminated with one or more stop elements. The following figure shows the sequence in which the elements are transmitted.

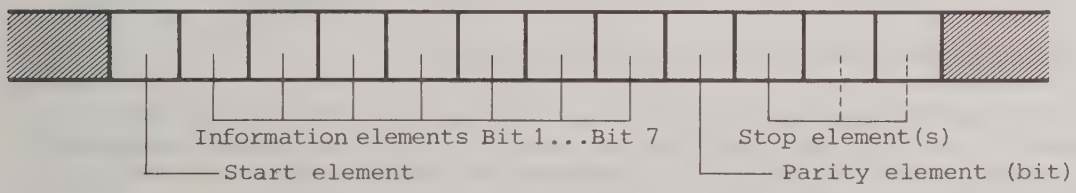


Fig. 7/2 Character structure for bit-serial data transmission

When data are transferred in parallel, a separate data line must be provided for each bit of a character and for the parity bit. The characters issued in parallel are synchronized via signal lines.

7.1 Serial interfaces

Printer and transmitting station are either connected direct or via modems.

When the printer is connected direct to a transmitting station, the send line of the transmitting station must be connected to the receive line of the Printer PT 80 i2. To transmit printer signals to the transmitting station, the send line of the printer must be connected to the receive line of the transmitting station (see also Fig. 7/3).

Data flow between transmitting system and printer can either be controlled via the BUSY signal or with protocols (strap W29.8).
The BUSY signal is transmitted over the "transmitted data" line and the BUSY line.

Attention: The interface signals are still undefined immediately after printer "power ON". Data transmission to the printer may not start until the printer has been switched to the ON-LINE mode.

- Data flow controlled via the BUSY signal:

  This signal is used to indicate to the transmitting station that the printer is "ready to receive" or "not ready to receive".

  The Printer PT 80 i2 transmits "ready to receive" when the following conditions are satisfied:
  - "power ON" and
  - ON-LINE mode and
  - receive buffer can accept information.

  The transmitting station can start the data transmission.

  The Printer PT 80 i2 transmits "not ready to receive":

  - 40 characters before its receive buffer is full or
  - when it is in the fault condition (the contents of the receive buffer are retained) or
  - on switching to the OFF-LINE mode: pushbutton [ON/OFF LINE] actuated

- Data flow controlled with protocol X-ON/X-OFF:

  When this protocol is used, data flow is controlled with control characters DC1 and DC3. The BUSY line is tied to -12 V. The printer transmits the control character DC1 to the transmitting station when it is "ready to receive", i.e. when the following conditions are satisfied:
  - "power ON" and
  - ON-LINE mode and
  - receive buffer can accept information.

  The transmitting station can start the data transmission.

The Printer PT 80 i2 transmits the control character DC3 "not ready to receive":

- 40 characters before its receive buffer is full or
- when it is in the fault condition (the contents of the receive buffer are retained) or
- on switching to the OFF-LINE mode: pushbutton [ON/OFF LINE] actuated

The control characters are always transmitted in the sequence DC1, DC3, DC1, DC3...

Exception: When data are received in the OFF-LINE mode, DC3 is again transmitted in response to "buffer full".

Within the framework of the X-ON/X-OFF protocol, the protocols ETX/ACK and/or ESC/device identification can also be used.

- Protocol ETX/ACK

  When the protocol ETX/ACK is used, the received data are transmitted block-serially by the transmitting station. The maximum length of the data block is 2 Kbytes. It must be closed with the control character ETX.

  The printer responds by transmitting the control character ACK, when it has recognized the control character ETX as data is being read out of the receive buffer. If the control character ACK should not be transmitted until the last character has been printed out, the data block must contain a line end character such as CR immediately in front of the control character ETX.

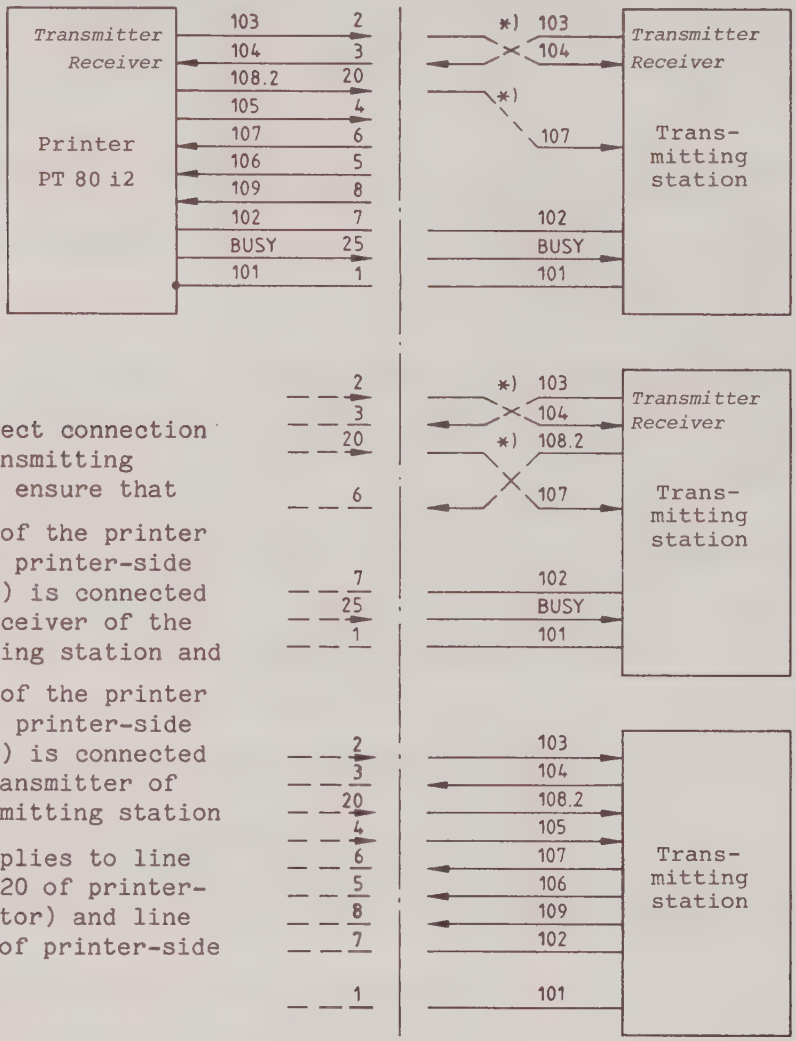
- Protocol ESC/device identification

  This protocol should be used when different types of printer are connected to a transmitting station.

  To request the device identification, the transmitting station sends the control character sequence ESC [C. When the printer is ready to operate and receive, it transmits the device identification (ESC [? s).

7.1.1 V.24/V.28 and RS-232-C interface

The Printer PT 80 i2 is connected to a transmitting station via a V.24/V.28 (RS-232-C) interface as shown in Fig. 7/3.



*) With direct connection to a transmitting station, ensure that

- line 103 of the printer (pin 2 of printer-side connector) is connected to the receiver of the transmitting station and
- line 104 of the printer (pin 3 of printer-side connector) is connected to the transmitter of the transmitting station

The same applies to line 108.2 (pin 20 of printer-side connector) and line 107 (pin 6 of printer-side connector)

Fig. 7/3 Connections via the V.24/V.28 (RS-232-C) interface

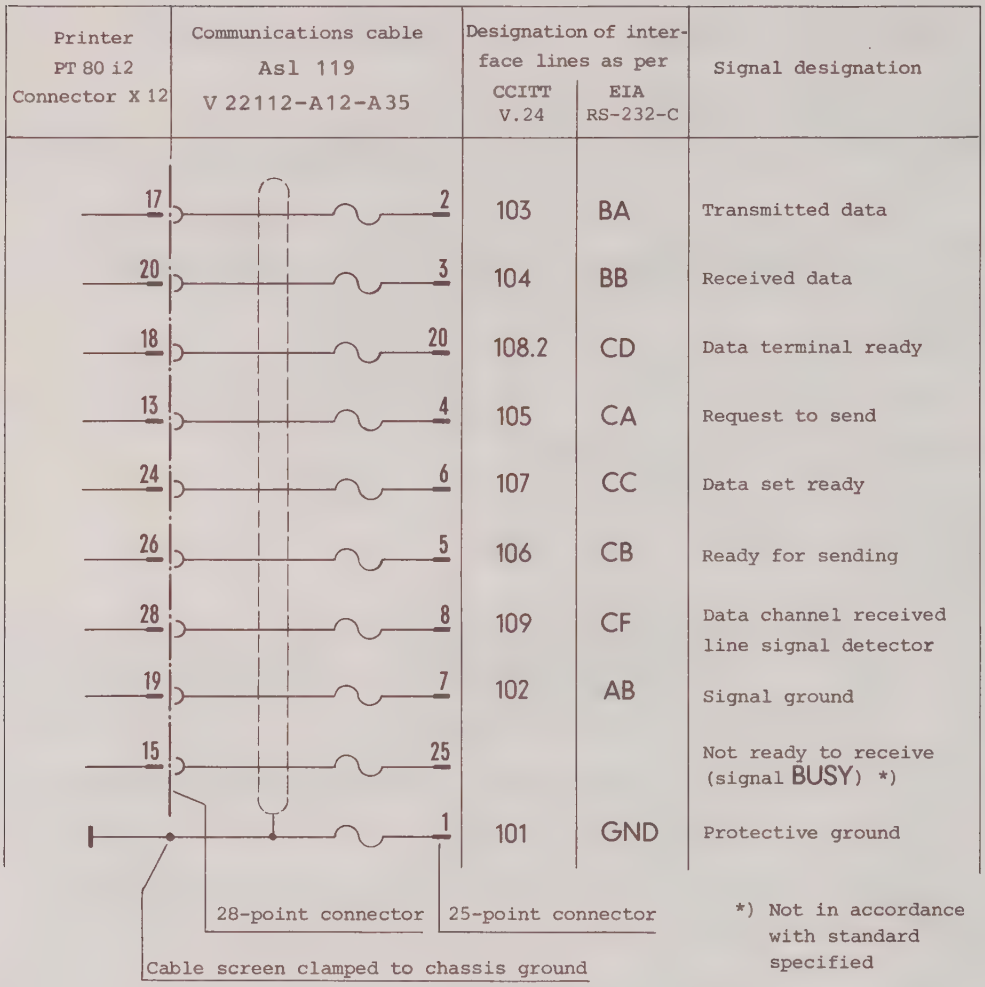
Electrical characteristic data

- Maximum permissible line length: 100 ft (30 m)

- Definitions of the signal levels on the interface lines:

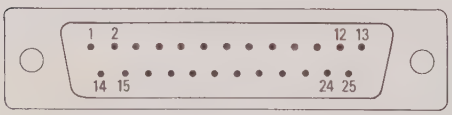
Lines	Signal level	Binary state	
Data lines (103, 104)	U ≥ +3 V	"Ø" (start polarity)	
	U ≤ -3 V	"1" (stop polarity)	
Control and signal lines (105, 106, 107, 108.2 109)	U ≥ +3 V	ON state	
	U ≤ -3 V	OFF state	
		With strap W27.8	Without strap W27.8
BUSY *)	U ≥ +3 V	ready to receive	not ready to receive
	U ≤ -3 V	not ready to receive	ready to receive

*) The assignment of the signal levels also applies if the BUSY signal is transmitted over line 103


Printer
PT 80 i2
Connector X 12
Communications cable
Asl 119
V 22112-A12-A35
Designation of interface lines as per
CCITT V.24
EIA RS-232-C
Signal designation
17 2 103 BA Transmitted data
20 3 104 BB Received data
18 20 108.2 CD Data terminal ready
13 4 105 CA Request to send
24 6 107 CC Data set ready
26 5 106 CB Ready for sending
28 8 109 CF Data channel received line signal detector
19 7 102 AB Signal ground
15 25 Not ready to receive (signal BUSY) *)
1 101 GND Protective ground
28-point connector
25-point connector
*) Not in accordance with standard specified
Cable screen clamped to chassis ground

28-pin connector
(Berg Electronics Division
System 65043)

D subminiatur connector
25-pin

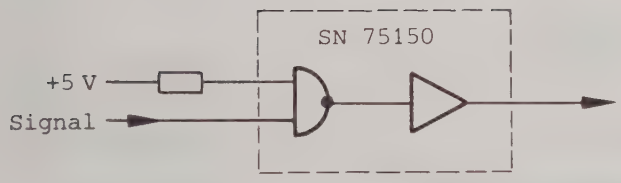


Ordering designations (SIEMENS AG):

1 Jack housing	C22334-Z1000-C56
9 Contact jacks	C22334-Z1000-C37
1 Marking clamp, green	C22334-A1000-C24
1 Marking clamp, black	C22334-A1000-C27
1 Screened cable	V45581-B121-A5
1 25-pin connector	V22121-A225-A1
Receptacle	
1 25-pin jack strip	V22121-A225-A4

Fig. 7/4 Data cable for the V.24/V.28 (RS-232-C) interface

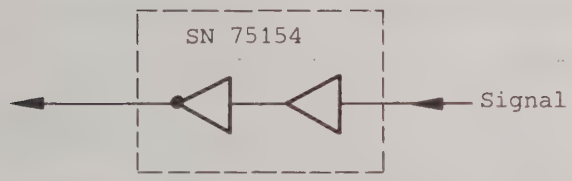
If other screened data cables are used, this screening must be connected to chassis ground in the Printer PT 80 i2 at the mounting bracket.



Output level: min. ± 5 V
max. ± 12 V

Load resistance: max. 7 kohm
min. 3 kohm

Fig. 7/5 Output circuit for the signals 103, 108.2, 105 and BUSY

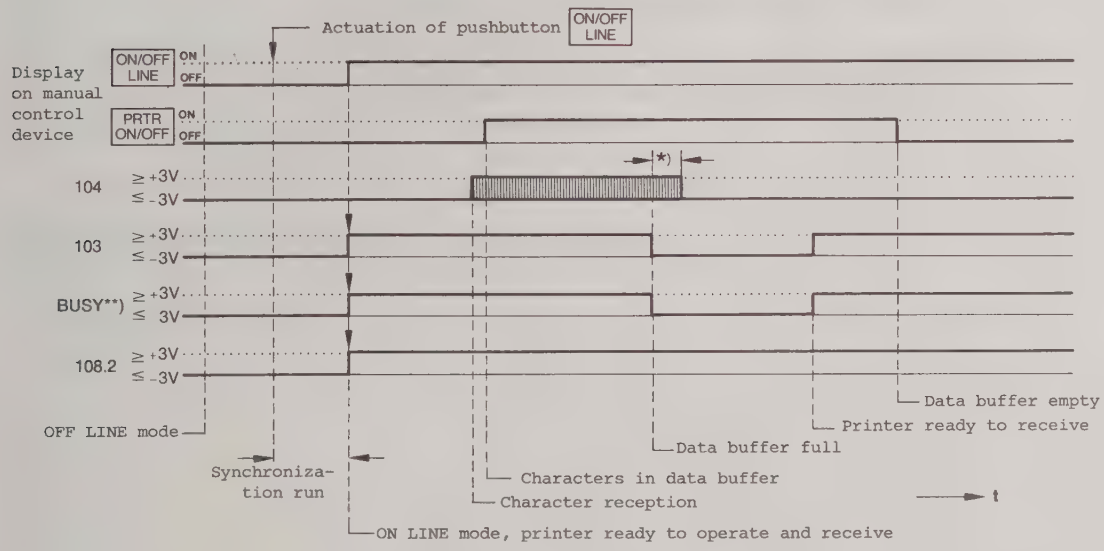


Input level: max. ± 15 V
min. ± 5 V

Load resistance: max. 7 kohm
min. 3 kohm

Fig. 7/6 Input circuit for signals 104, 107, 106 and 109

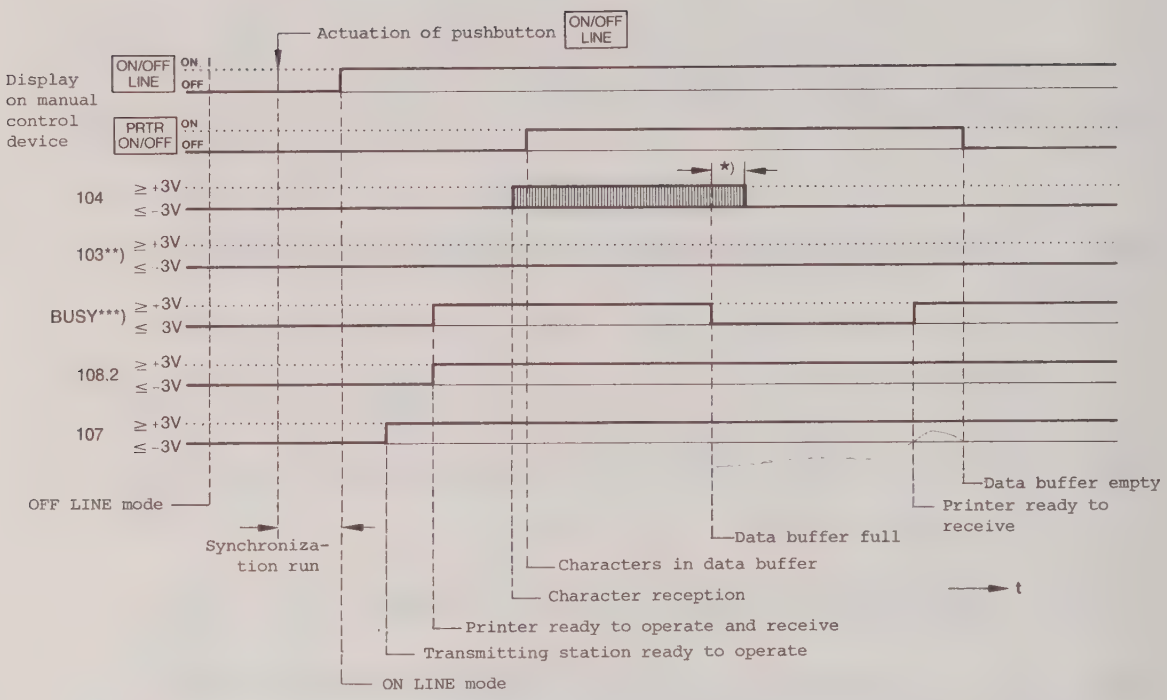
Figs. 7/7, 7/8 and 7/9 show interface diagrams for data flow control via the BUSY signal line (strap W29.8 not inserted)



*) A maximum of 40 characters can be received

**) BUSY signal not inverted (strap W 27.8 inserted)

Fig. 7/7 Interface diagram for operation via lines 103, 104, 108.2 and BUSY (straps W29.6, W29.7 inserted)

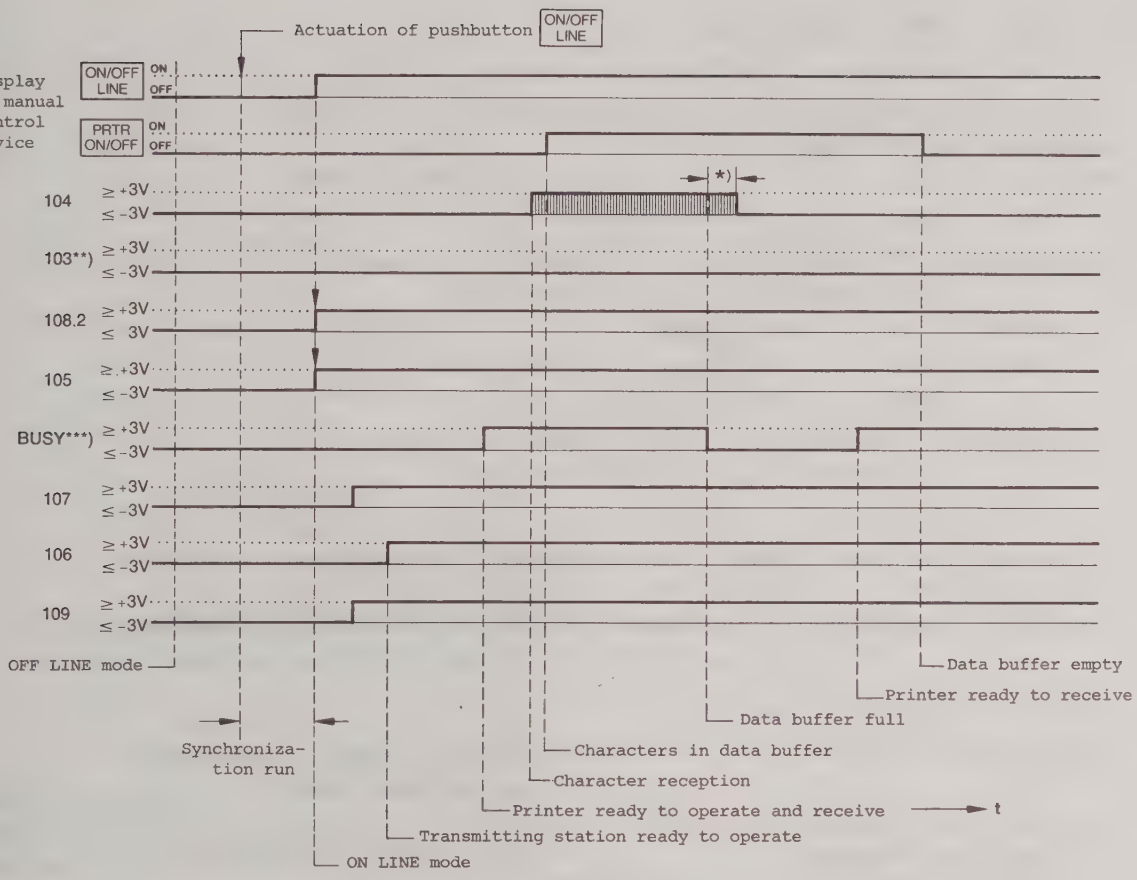


*) A maximum of 40 characters can be received

**) The BUSY signal is not transmitted on line 103

***) BUSY signal not inverted (strap W 27.8 inserted)

Fig. 7/8 Interface diagram for operation via lines 108.2, 107 and BUSY (strap W29.6 inserted, W29.7 not inserted)



*) A maximum of 40 characters can be received

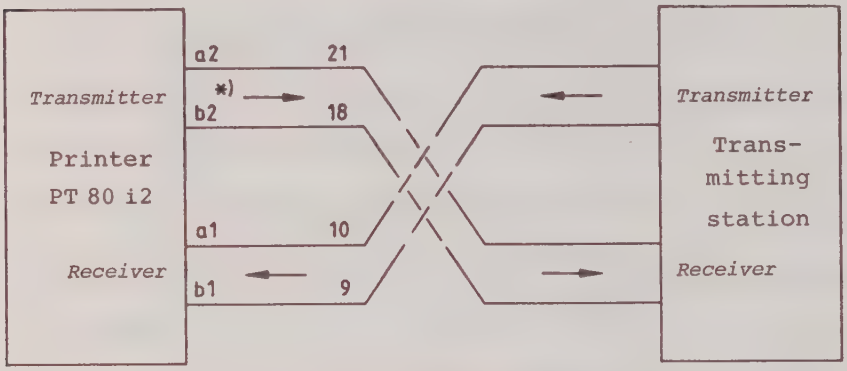
**) The BUSY signal is not transmitted on line 103

***) BUSY signal not inverted (strap W 27.8 inserted)

Fig. 7/9 Interface diagram for modem operation (strap W29.6 not inserted, W29.7 inserted)

7.1.2 TTY interface

Transmitting stations with a TTY interface (20 mA current loop) are connected as per Fig. 7/10.



*) With data flow control without X-ON/X-OFF protocol, the BUSY signal is transmitted over send line a 2, b 2 of the printer

Fig. 7/10 Connection of the Printer PT 80 i2 via the TTY interface

Electrical characteristic data

Line length: 100 ft (30 m) (greater line lengths depend on the data rate)

Internal power source (line fed by printer)
- Operating voltage: +12 V (positive pole to b2 or b1)
- Line current: 20 mA
- Output voltage at 20 mA
  - Transmitter: approx. 3 V
  - Receiver: approx. 3 V
- No dc decoupling of the send and receive circuits
- Resistant to short circuits

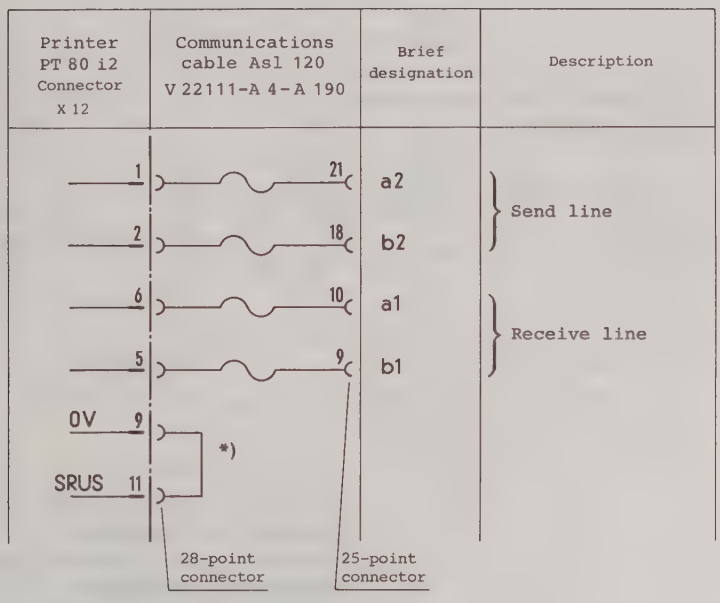
External power source (line fed externally)
- Operating voltage: 20 to 48 V
- Line current: 20 mA
- Maximum permissible current: 80 mA
- Voltage drop at 20 mA (without protective resistor)
  - Transmitter: approx. 3 V
  - Receiver: approx. 3 V
- The transmitter and the receiver are not dependent on polarity
- Dc decoupling of the send and receive circuits

Level assignment

Data lines
- Current: stop polarity
- No current: start polarity

BUSY signal with strap W27.8 inserted
- Current: not ready to receive
- No current: ready to receive

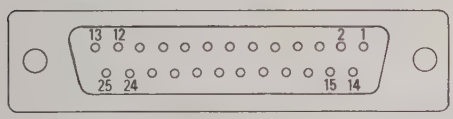
BUSY signal without strap W27.8
- Current: ready to receive
- No current: not ready to receive



*) The connecting strap (9-11) in the jack strip of the data cable switches from the V.24/V.28 (RS-232-C) interface to the TTY interface.

28-pin connector
(Berg Electronics Division)
System 65043)

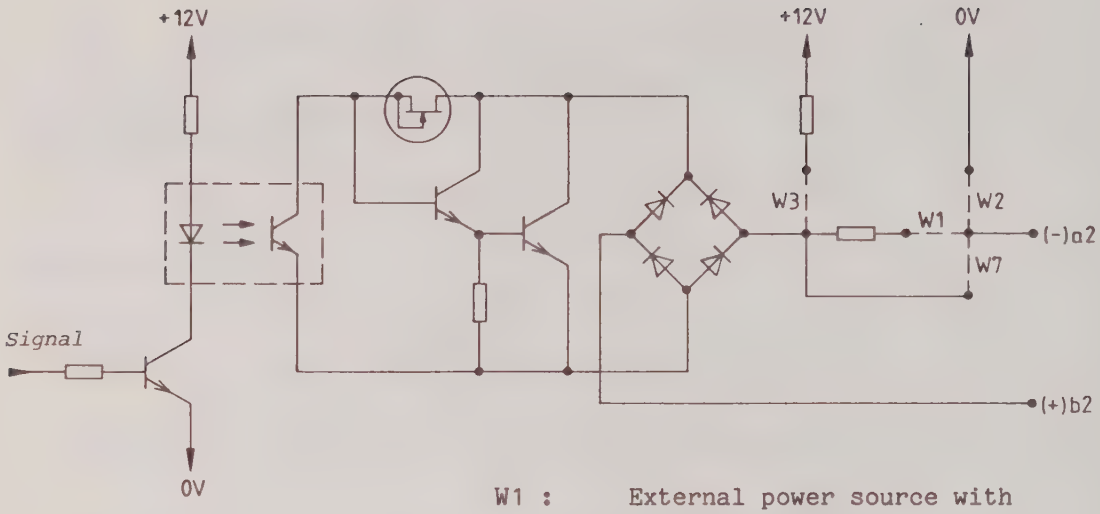
D subminiatur connector
25-pin



Ordering designations (SIEMENS AG)

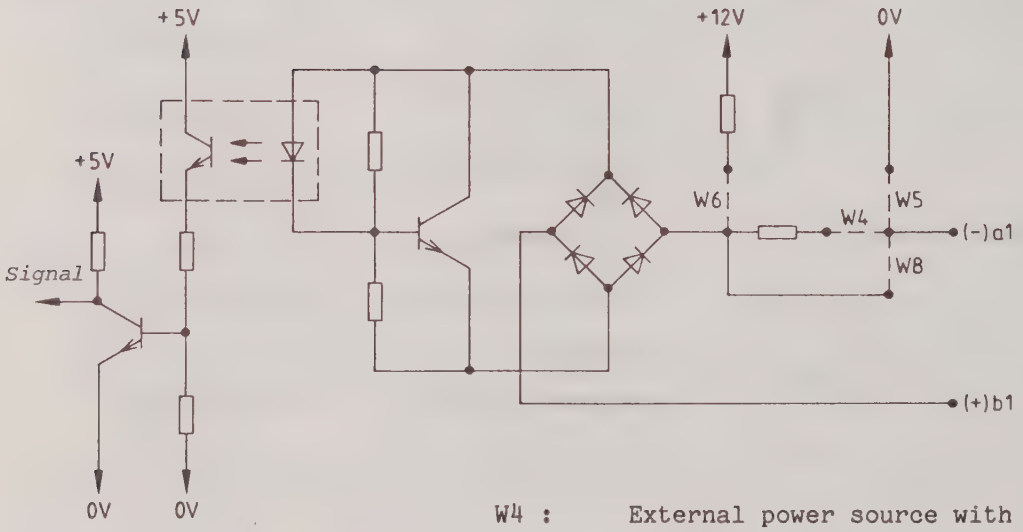
1 Jack housing	C22334-Z1000-C56
6 Contact jacks	C22334-Z1000-C37
1 Marking clamp, green	C22334-A1000-C24
1 Marking clamp, black	C22334-A1000-C27
1 4-pin cable	D47414-A421
1 25-pin jack strip	V22121-A225-A7
Receptacle:	
1 25-pin connector	V22121-A225-A6

Fig. 7/11 TTY interface



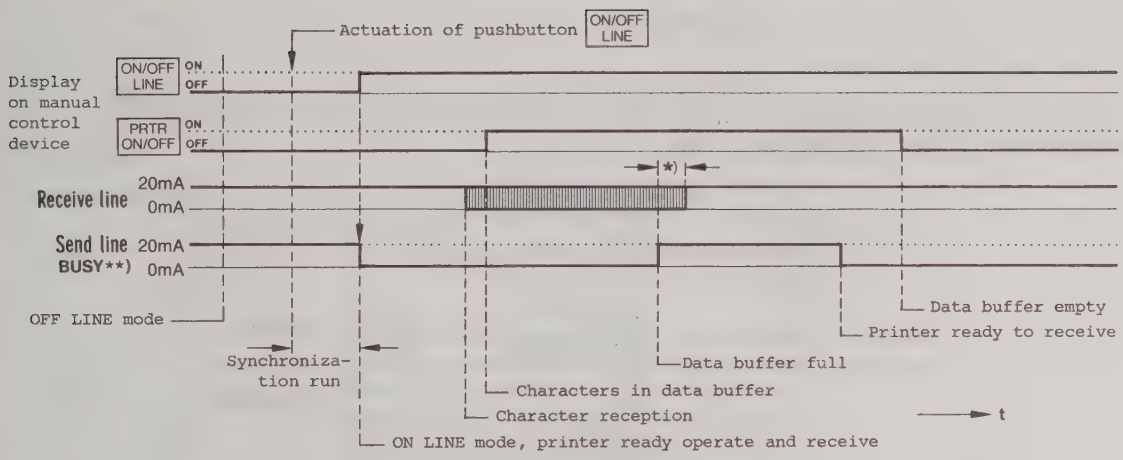
W1 : External power source with protective resistor
W7 : External power source without protective resistor
W2, W3 : Internal power source

Fig. 7/12 TTY transmitter



W4 : External power source with protective resistor
W8 : External power source without protective resistor
W5, W6 : Internal power source

Fig. 7/13 TTY receiver



*) A maximum of 40 characters can be received

**) BUSY signal not inverted (strap W 27.8 inserted)

Fig. 7/14 Interface diagram for operation via the TTY interface

7.2 Parallel interface

The Printer PT 80 i2 is equipped with a Centronics®-type interface for bit-parallel data transfer (Fig. 7/15).

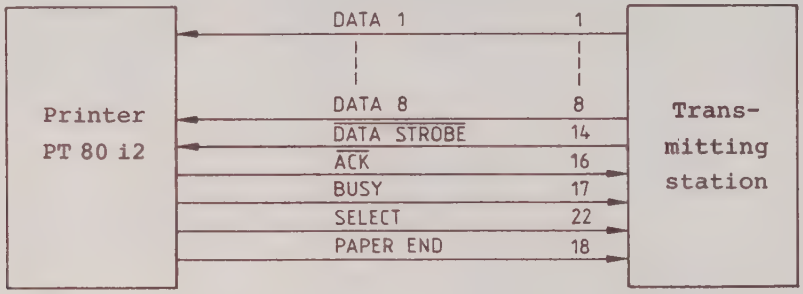


Fig. 7/15 Connection of the Printer PT 80 i2 via the Centronics-type interface

Electrical characteristic data

- Maximum permissible line length: 20 ft (6 m)
- The data and control signals are transmitted on the interface lines using TTL level.

Signal assignment

	low (log. "Ø")	high (log. "1")
Output values	≤ +0.4 V	≥ +2.4 V
Input values	≤ +0.8 V	≥ +2 V

Data and control signals

Signal name	Function
SELECT (GE.GRAW.H)	This signal indicates the printer status to the transmitting station: high = printer in ON-LINE mode low = printer not in ON-LINE mode (OFF-LINE mode, fault condition, test mode)
DATA 1...8 (EMJN1.H...EMJN8.H)	Receive lines for data bits 1 to 8
DATA STROBE (DNME.L)	This is the synchronization signal (Fig. 7/16) for data signal transfer (data bits 1 to 8)
BUSY (GE.NJUEBE.H)	When this signal is activated (high), there is no data transfer. The signal is high when: - the receive buffer is full - the SELECT signal is low (inactive) - during character acceptance
ACK = ACKNOWLEDGE (GE.DNQU.L)	The printer transmits this signal to the transmitting station: - When it has processed the received signal. (It thus indicates that a further signal can be received.) - With "power ON", when the ON-LINE mode is reached. - On switching from the OFF-LINE to the ON-LINE mode.
PAPER END (GE.DTEN.H)	This signal indicates to the transmitting station that paper and/or ink are exhausted. Data are not accepted.

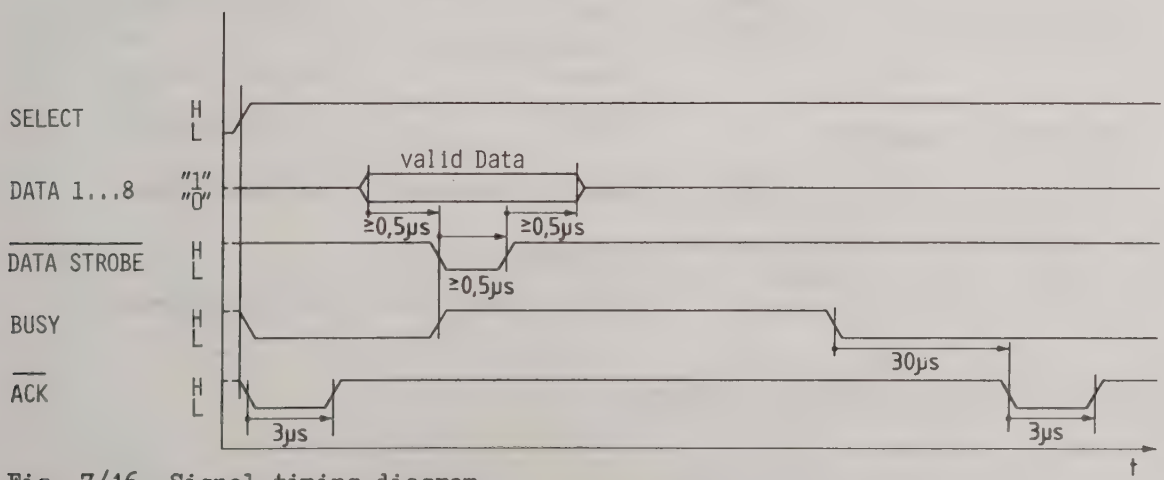


Fig. 7/16 Signal timing diagram

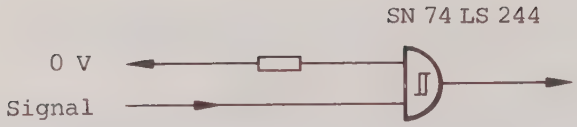


Fig. 7/17 Output circuit for the signals ACK, BUSY, SELECT and PAPER END

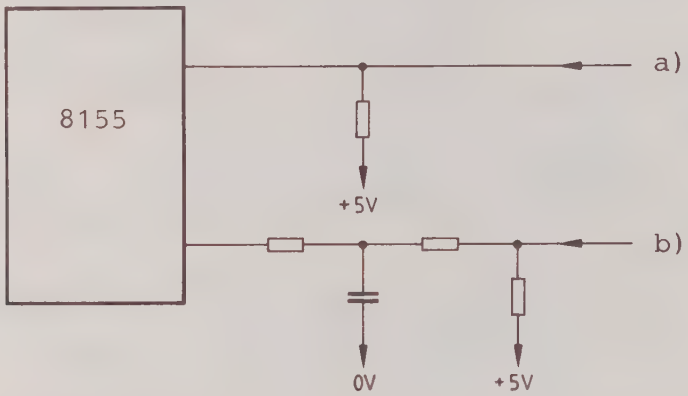
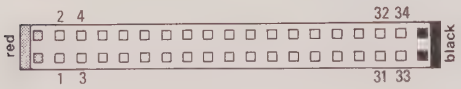


Fig. 7/18 Input circuits a) for the signals DATA 1-8
b) for the signal DATA STROBE

34-pin connector
(Berg Electronics Division
System 65043)



D subminiatur connector
25-pin

Ordering designations (SIEMENS AG)

1 Jack housing	C22334-Z1000-C59
34 Contact jacks	C22334-Z1000-C97
1 Marking clamp, red	C22334-A1000-C25
1 Marking clamp, black	C22334-A1000-C27
1 Cable	V45481-A162-A5
1 25-pin connector	V22121-A225-A1

Receptacle:

1 25-pin jack strip	V22121-A225-A4

Fig. 7/19 Centronics®-type interface

Printer PT 80 i2 Connector X 11	Communications cable Asl 118 V 22112-A23-A 9	Brief designation	Description
1	9	0 V	
2	1	DATA 1	Receive information 1
3		0 V	
4	2	DATA 2	Receive information 2
5	10	0 V	
6	3	DATA 3	Receive information 3
7		0 V	
8	4	DATA 4	Receive information 4
9	11	0 V	
10	5	DATA 5	Receive information 5
11		0 V	
12	6	DATA 6	Receive information 6
13	12	0 V	
14	7	DATA 7	Receive information 7
15		0 V	
16	8	DATA 8	Receive information 8
17	15	0 V	
19		0 V	
20	14	DATA STROBE	Data strobe
21		0 V	
22	16	ACK	Acknowledge
24	17	BUSY	Not ready to accept
25	21	0 V	
26	22	SELECT	Device select
27		0 V	
28	18	PAPER END	End of data medium
0V 33			
PRUS 34 *)	25	Screen	
0V			
18 +5V			
23			
29			
30 0V			
31			

34-point connector

25-point connector

*) The contact strap (33-34) in the jack strip switches to the Centronics - interface

8 Accessories and options

8.1 Ink cartridge

Ink cartridge A80 (pack of five), SIEMENS ordering designation S22761-J2-D1 (The ink cartridge package is marked with the expiration date for cartridge use.) Proper functioning is only guaranteed if the ink is obtained from us.

8.2 Roll paper

Commercially available roll paper for ink-jet printing with width of 8 1/4" (209 mm) or 8 1/2" (216 mm), roll diameter 5" (120 mm) max.

8.3 Margin-perforated fanfold paper

Commercially available fanfold paper for ink-jet printing :

Fold length 11" or 12" with width of 8 1/2" (216 mm), 9 7/8" (250 mm), 14 7/8" (377.8 mm) and 15 3/4" (400 mm)

8.4 Power cable

SIEMENS AG	Version for 120 V	Item code no. V22113-A3-A38
	Version for 220 V	Item code no. V22113-A3-A17

8.5 Additional facilities

Paper supply tray (Fig. 8/1)

Version for printer using

- paper width of up to 9 7/8" (250 mm)	Ordering no. C22200-A1080-A1
- paper width of up to 15 3/4" (400 mm)	Ordering no. C22200-A1080-A21

Paper tray (Fig. 8/2)

Version for printer using

- paper width of up to 9 7/8" (250 mm)	Ordering no. C22200-A1000-A1
- paper width of up to 15 3/4" (400 mm)	Ordering no. C22200-A1000-A11

Pedestal (Fig. 8/2)

Version for printer using

- paper width of up to 9 7/8" (250 mm)	Ordering no. S22711-T505
- paper width of up to 15 3/4" (400 mm)	Ordering no. S22751-T500-A2

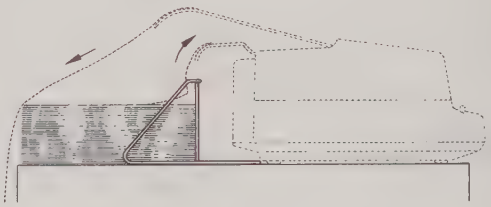


Fig. 8/1 Paper supply tray

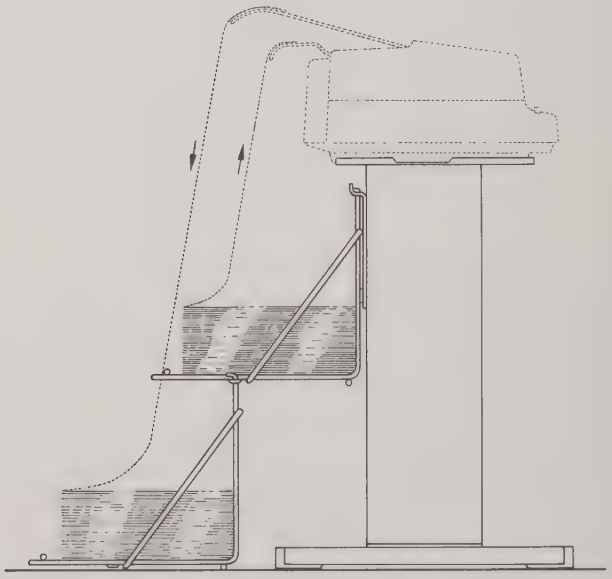


Fig. 8/2 Pedestal with paper tray

9 Cleaning

The outside of the printer can be cleaned when necessary.

If dusty: with dust cloth or brush.

If slightly dirty: with cloth moistened with soapy water or household detergent.

If very dirty: with Freon TF® (Du Pont).
Cleansing agents containing alcohol (spirit) may be used except for the viewing window in the top cover.

Tear off along the perforation

Control characters

Paper movement

FF	Form feed
ESC [n p	Form length (n in 1/6"-steps, 1–99 decimal)
ESC [p	Reset form length to strap setting
ESC [n1 ; n2 {	First and last print line (n in 1/6" steps up to max. form length)
ESC [{	Reset to full form length
LF	Line feed
ESC [n x	Line spacing (n in 1/24" steps, 1–99 decimal)
ESC [x	Reset to 1/6" line spacing (single line)
VT	Vertical tabulator jump (absolute)
VT n n	Vertical tabulator jump (relative nn = Ø1–99 decimal)
ESC [n1 ; n2 ... r	Up to 12 absolute vertical tabs (n in 1/6" steps, 1– max. form length decimal)
ESC [4 g	Reset to relative tabulator

Print mechanism movement

SP	Space
BS	Backspace
CR	Carriage return
ESC [1 w	Character spacing 1/10"
ESC [2 w	Character spacing 1/12"
ESC [4 w	Character spacing 1/16,5"
ESC [8	Expanded print ON (one character = two print positions)
ESC [<	Expanded print OFF
ESC Ø	Underlining ON
ESC 9	Underlining OFF
ESC [n1 ; n2 s	First and last print position (n in 1/10" steps, 1–132 decimal)
ESC [s	Reset to max. line lenght
HT	Horizontal tabulator jump (absolute or fixed at 8-character intervals, strap setting)
HT nn	Horizontal tabulator jump (relative nn = ØØ1 – max. line length decimal)
ESC [n1 ; n2 ... q	Up to 12 absolute horizontal tabs (n in current character spacing, 1 – max. line length decimal)
ESC [3 g	Reset horizontal tabulator to strap setting
ESC [n SP E	Proportional spacing with n filler steps (n in 1/7 character spacing, 1–13 decimal)
ESC [SP E	Character spacing OFF

Character sets of character generator

ESC (@	International
ESC (A	Great Britain
ESC (B	ASCII
ESC (E	Denmark/Norway
ESC (H	Sweden/Finland
ESC (K	Germany
ESC (R	France/Belgium
ESC (Ø	Netherlands
ESC =	Reset to strap setting
ESC 4	Reset to strap setting but including resetting of expanded print and underlining
ESC 5	Switchover to down-loadable character generator
ESC =	Switchback to preset character generator
ESC [t	Load down-loadable character generator

General control characters

ESC c	Reset to initial status (master reset)
BEL	Bell
DC 1	Printer not busy (X-ON)
DC 3	Printer busy (X-OFF)
ETX	End of text
ACK	Acknowledge
ESC [C	Request device identification
ESC [? s	Device identification

Graphics printing

ESC [I	Scanner method, normal dot density
ESC [J	Scanner method, double dot densitiy
ESC [y	Bit image, normal dot density
ESC [z	Bit image, double dot density
ESC [n SP r	Bit image, print head positioning (n in print columns)
ESC [n1 ; n2 v	Bit image, print repetition (n in print columns)
ESC [	Graphics printing OFF

Fault indications

Display flashes: paper and/or ink end

Buzzer: If the buzzer sounds immediately after switching on, and one or more displays are illuminated, an electrical fault is present. Please refer to the User's Manual.

Ink traces missing: Wash out ink-jet print head.

Notes:

For detailed information, please refer to the User's Manual **A22751-A80-M200-*-7635**

Stand: 4. 84

SIEMENS

Printer PT 80 i 2

Quick Reference Guide.

Pushbutton functions
Test mode

Power switch

The power switch is located at the rear of the printer below the power connector. An automatic test program is run in response to "power ON". A fault is indicated by an audible signal (see User's Manual).

Manual control device

PRTR ON/OFF	Display illuminated:	Data in receive buffer
	Display flashes:	Paper or ink end
PAPER FEED	Paper feed Brief depression:	Paper advances 1/4 line (1/24")
	Held down:	Paper advances steadily for period of depression
PAPER BACK	Paper reverse:	Paper is fed back 1/4 line (1/24") each time pushbotton is pressed
FF LOC	Form feed:	Paper advances to next start-of-form position
ON/OFF LINE	ON/OFF-LINE selection Pushbutton illuminated:	ON-LINE mode. Data are printed.
	Pushbutton dark:	OFF-LINE mode.
TOF	Top-of-form position:	With this pushbutton depressed, line counter is reset by pressing push-button "FF-LOC". Current paper position becomes top-of-form position.
TEST	Test mode Pushbutton illuminated:	Test mode ON (only in OFF-LINE mode)
	Pushbutton dark:	Test mode OFF
	No function	Pushbuttons without inscriptions have no function.

Test mode

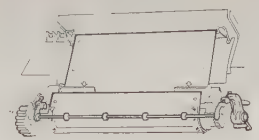
ON/OFF LINE	Activate OFF-LINE mode:	Display in pushbutton goes dark
TEST	Test mode ON:	Display in pushbutton illuminated.
PAPER FEED	Test mode start:	Printer is reset to initial status and offers the first test program.
PAPER BACK	Test program selection program:	Printer offers the next test.
PAPER FEED	Test program ON:	Printer starts the offered test program.
PAPER BACK	Test program OFF:	Current test program ist stopped and next program is offered.
TEST	Test mode OFF:	Test mode is deactivated.

Testprograms

Program 1:	Contents of character generator
Program 2:	H test (column offset)
Program 3:	12-nozzle test
Program 4:	Line contact test
Program 5:	Bit-image test

Fanfold paper
Top-of-form position

Fixed paper guide



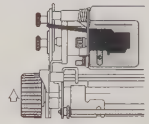
Introduce paper under top cover and through into paper guides until the leading edge is below platen.

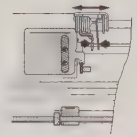
Ensure that pins of the platen engage the perforation at the same level on both sides of the paper.

Set paper release lever to lower position.

Establish top-of-form position
– See below –

Adjustable paper guide





Open left-hand flap and feed paper through under the top cover.

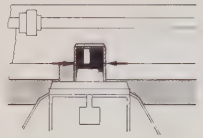
Slide paper at the side under left-hand flap and place on pin wheel.
Ensure that the perforation is engaged by at least two pins.
Close left-hand flap.

If paper format has been changed, squeeze the clamping wire (arrow) and displace right-hand paper guide until perforation and transport pins are in line.
Place paper on flap (closed).

Open right-hand flap and slide paper at the side under flap.
Ensure that both sides of the paper are engaged by the pins at the same level.

Establish top-of-form position
– See below –

Top-of-form position



Advance paper with rotary knob until leading edge or perforated fold is visible at upper edge of the paper guide.

Advance paper with PAPER FEED pushbutton only in single steps until leading edge or perforated fold is in line with lower edge of wiper window (arrows).

With TOF pushbutton depressed

Press FF LOC pushbutton briefly.

The top-of-form position is established.

Then:

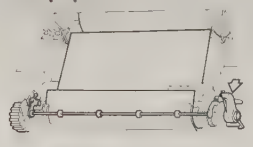
Advance paper **only** with pushbutton until tear-off edge is reached. PAPER FEED

NOTE:

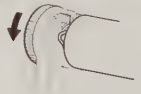
If one of the pressure rollers of the paper pressure rod comes into contact with the pressure spring, push roller to the side to avoid a paper jam.

Roll paper
Ink cartridge

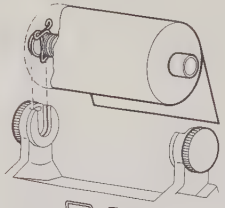
Roll paper



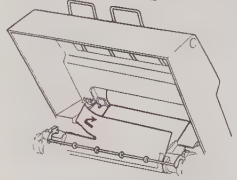
Swing paper release lever and paper pressure rod upward.



Release the paper roll axle on both sides and draw out remaining paper to the rear.



Push paper roll axle into the new roll (wire clip must be in contact with the paper), slot axle into holders and lock in place. The O-ring on the axle must lie in groove of left-hand holder.

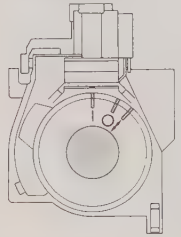


Swing paper release lever downward and lead paper through under the top cover into the paper guides until it is located below the paten.

Advance paper with plate rotary knob until it is past the tear-off edge.

Set paper pressure rod to its lower position and tear off protruding paper at tear-off edge to rear.

Ink cartridge



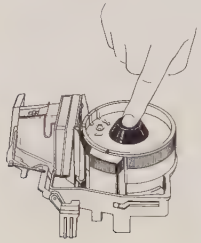
Turn ink cartridge to the left to this position and pull up and out.

Load new ink cartridge in this position and while pressing down lightly on ink cartridge.....

.....turn to the right to this position and wash out (see below).

NOTE:
This symbol marks the transport position. The ink cartridge must be in this position if the printer is moved or transported.

Washing out



If the print quality is poor and when the ink cartridge is replaced, the print head must be washed out.

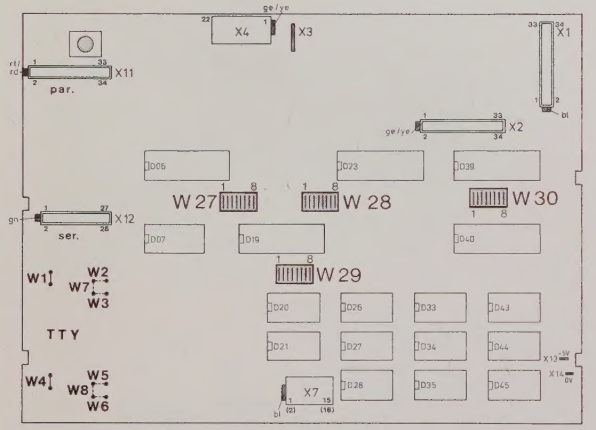
Force a small amount of ink through nozzles by briefly exerting strong pressure on the plate/pushbutton of the ink cartridge. The wiper mus be in its upper position.

From time to time – above all before transport – check whether ink has collected below the ink cartridge. The ink cartridge must be removed for this purpose. Remove ink, if necessary, with absorbent lint-free material (tampon, for instance).

Basic electronics

Note:

If strap settings are changed, turn the ink cartridge to ist transport position, remove the cover and swing the printer module upward (see User's Manual).



Programming straps

● = strap, ○ = no strap

Settings for printer initial status

Strapping plug W27

Plug straps 1	2	3	4	5	6	7	8	Function	
●	●	●						ASCII	Character generator
●	●	○						Sweden/Finland	
●	○	●						Denmark/Norway	
●	○	○						Germany	
○	●	●						Great Britain	
○	●	○						Netherlands	
○	○	●						France/Belgium	
○	○	○						International	
			○	○				Not used	
					●			Horizontal tabulator stop every 8 characters	
					○			Relative horizontal tabulator	
						●		Pushbutton "FF" also effective in ON-LINE mode	
						○		Pushbutton "FF" only effective OFF-LINE mode	
							●	BUSY	see strap W29.8
							○	BUSY inverted	

Strapping plug W28

Plug straps 1	2	3	4	5	6	7	8	Function	
●								Form length 66 lines	
○								Form length 72 lines	
	●							CR = only CR	Control character significance
	○							CR = CR and LF	
		●						FF = only FF	
		○						FF = FF and CR	
			●					VT = only VT	
			○					VT = VT and CR	
				●				LF = only LF	
				○				LF = LF and CR	
					●	●		1/10″	Character spacing
					○	○		1/10″	
					●	○		1/12″	
					○	●		1/16.5″	
							●	No control character printing	
							○	Printing including control characters	

Programming straps

● = strap, ○ = no strap

Strapping plug W29

Plug straps 1	2	3	4	5	6	7	8	Function	
●	●							No parity bit b8 = H	Transmission of acknowledgements
○	○							No parity bit b8 = L	
●	○							Even parity	
○	●							Odd parity	
		●	●	●				9600 bit/s	Data rate for serial transfer
		●	●	○				4800 bit/s	
		●	○	●				2400 bit/s	
		●	○	○				1200 bit/s	
		○	●	●				600 bit/s	
		○	●	○				300 bit/s	
		○	○	●				200 bit/s	
		○	○	○				110 bit/s	
					●	●		CCITT V.24 103, 104, 108.2, BUSY	
					●	○		CCITT V.24 103, 104, 108.2, 107, BUSY	
					○	●		MODEM	
							●	X-ON/X-OFF ETX/ACK	
							○	BUSY ON (BUSY also on line 103)	

Programming straps for TTY

Solder strap W 1	2	3	4	5	6	7	8	Function
○	●	●				●		Transmitter, internal supply
●	○	○				○		Transmitter, external supply with protective resistor
○	○	○				●		Transmitter, external supply without protective resistor
			○	●	●		○	Receiver, internal supply
			●	○	○		○	Receiver, external supply with protective resistor
			○	○	○		●	Receiver, external supply without protective resistor

IA No 5

Standard characters of international alphabet

	0		1		2		3		4		5		6		7	
0	00 000	NUL	10 016	DLE	20 032	SP	30 048	0	40 064	@	50 080	P	60 096	`	70 112	p
1	01 001	SOH	11 017	DC1	21 033	!	31 049	1	41 065	A	51 081	Q	61 097	a	71 113	q
2	02 002	STX	12 018	DC2	22 034	"	32 050	2	42 066	B	52 082	R	62 098	b	72 114	r
3	03 003	ETX	13 019	DC3	23 035		33 051	3	43 067	C	53 083	S	63 099	c	73 115	s
4	04 004	EOT	14 020	DC4	24 036		34 052	4	44 068	D	54 084	T	64 100	d	74 116	t
5	05 005	ENQ	15 021	NAK	25 037	%	35 053	5	45 069	E	55 085	U	65 101	e	75 117	u
6	06 006	ACK	16 022	SYN	26 038	&	36 054	6	46 070	F	56 086	V	66 102	f	76 118	v
7	07 007	BEL	17 023	ETB	27 039	'	37 055	7	47 071	G	57 087	W	67 103	g	77 119	w
8	08 008	BS	18 024	CAN	28 040	(	38 056	8	48 072	H	58 088	X	68 104	h	78 120	x
9	09 009	HT	19 025	EM	29 041	)	39 057	9	49 073	I	59 089	Y	69 105	i	79 121	y
10	0A 010	LF	1A 026	SUB	2A 042	*	3A 058	:	4A 074	J	5A 090	Z	6A 106	j	7A 122	z
11	0B 011	VT	1B 027	ESC	2B 043	+	3B 059	;	4B 075	K	5B 091		6B 107	k	7B 123	
12	0C 012	FF	1C 028	FS	2C 044	,	3C 060	<	4C 076	L	5C 092		6C 108	l	7C 124	
13	0D 013	CR	1D 029	GS	2D 045	-	3D 061	=	4D 077	M	5D 093		6D 109	m	7D 125	
14	0E 014	SO	1E 030	RS	2E 046	.	3E 062	>	4E 078	N	5E 094		6E 110	n	7E 126	
15	0F 015	SI	1F 031	US	2F 047	/	3F 063	?	4F 079	O	5F 095	_	6F 111	o	7F 127	DEL

The dark fields denote the national special characters.
Columns and rows in decimal notation.
Data in boxes:
two places = hex. code; three places = dez. code

Special characters

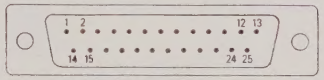
IA No. 5 Column	Row	DEZ.-Code	HEX.-Code	ASCII	Sweden Finland	Denmark Norway	Germany	Great Britain	Netherlands	France Belgium	International
2	3	035	23	#	§	#	#	£	£	£	#
2	4	036	24	$	¤	¤	$	$	$	$	¤
4	0	064	40	@	É	É	§	@	@	à	@
5	11	091	5B	[	Ä	Æ	Ä	[	[	°	[
5	12	092	5C	\	Ö	Ø	Ö	\	\	ç	\
5	13	093	5D	]	Å	Å	Ü	]	]	§	]
5	14	094	5E	^	^	^	^	^	^	^	^
6	0	096	60	`	é	é	`	`	`	ù	`
7	11	123	7B	{	ä	æ	ä	{	{	é	{
7	12	124	7C	|	ö	ø	ö	|	|	ù	|
7	13	125	7D	}	å	å	ü	}	}	è	}
7	14	126	7E	~	ü	ü	ß	~	~	¨	~

Serial Interfaces

Interface as per V.24/V.28 (RS 232 C)

A Pin	B Pin	Interface lines DIN 6620 Part 1	CCITT V.24/ V.28	EIA RS232C	Signal designations DIN 6620 Part 1 – CCITT/EIA RS 232C
2	17	D1	103	BA	Transmitted data
3	20	D2	104	BB	Received data
20	18	S1.2	108.2	CD	Data terminal ready
4	13	S2	105	CA	Request to send
6	24	M1	107	CC	Data set ready
5	26	M2	106	CB	Ready for sending
8	28	M5	109	CF	Received line signal detector
7	19	E2	102	AB	Signal ground
25	15	–	–	–	BUSY *)
Ch.	–	E1	101	GND	Protective ground

*) = not in accordance with standards given



A = 25-pin D subminiature connector for V.24/RS 232 C (male connector)

TTY interface

A	B	Brief designation	Signal designation
21	1	a2	Send line
18	2	b2	
10	6	a1	Receive line
9	5	b1	
–	9	–	TTY switchover
–	11	–	

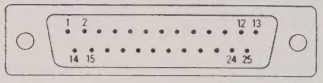
A = 25-pin D subminiature connector for TTY (female connector)

B = 28-pin Berg® connector X12 (female connector)

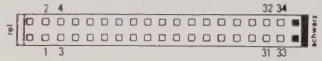
Parallel Interfaces

Centronics interface

A Pin	B Pin	Brief designation	Description
1	2	DATA 1	Receive bit 1
2	4	DATA 2	Receive bit 2
3	6	DATA 3	Receive bit 3
4	8	DATA 4	Receive bit 4
5	10	DATA 5	Receive bit 5
6	12	DATA 6	Receive bit 6
7	14	DATA 7	Receive bit 7
8	16	DATA 8	Receive bit 8
14	20	DATA STROBE	Data strobe
16	22	ACK	Acknowledge
17	24	BUSY	Not ready to receive
18	28	PAPER END	Paper/ink end
22	26	SELECT	Device select
9	1/3	GND	Ground
10	5/7	"	"
11	9/11	"	"
12	13/15	"	"
15	17/19/21	"	"
21	25/27	"	"
25	GND	PROTECTOR	Screen
–	33	Strap switches over to parallel mode	
–	34		



A = 25-pin D subminiature connector (male connector)



B = 34-pin Berg® connector (female connector)

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